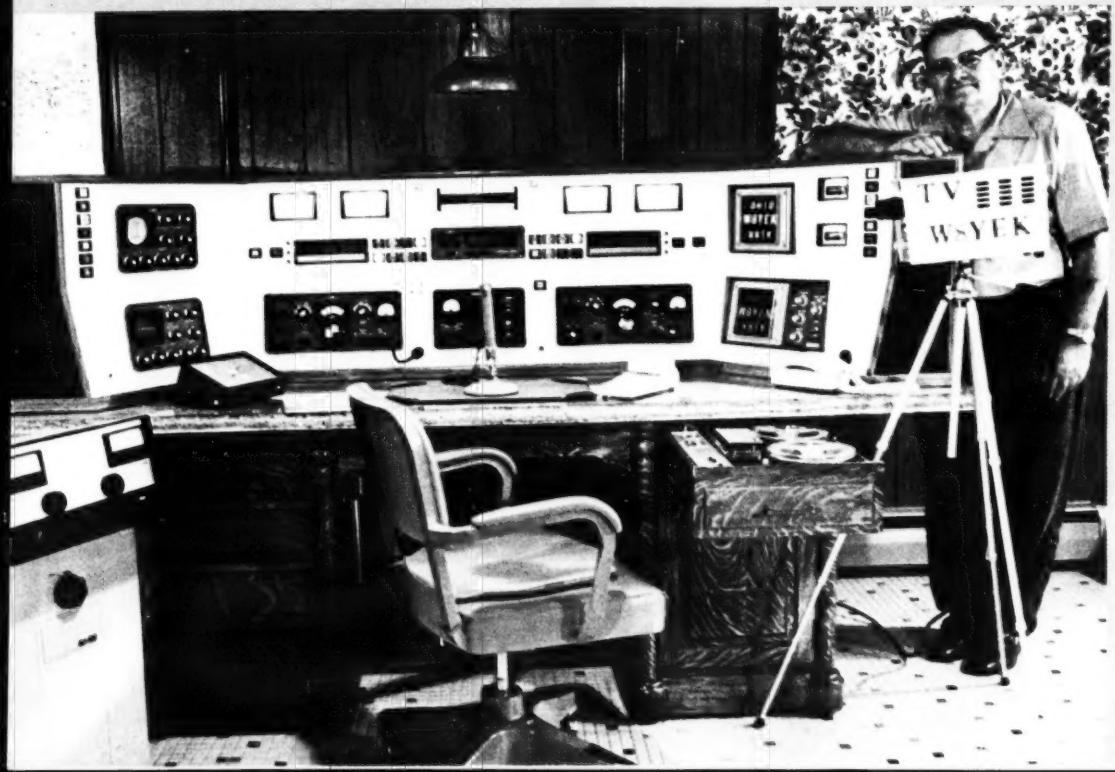
AMATEUR RADIO

73

W8KEY Works 100 Countries on SSTV (p. 120)



one inflated dollar
FEBRUARY 1975

DOCKET 20282 COMPLETE !

SUPER–KEY (p. 31) . . .

Your Own Repeater (p. 76) . . .

OSCAR 7 (p. 46, 54, 62) . . .

SSTV –
Fast Scan Monitor
Grey Scale Generator

HUSTLER®

the buck passing stops here!

No more buck passing—trading or shopping once you acquire a **Hustler two-meter colinear.** It is the ultimate in mobile antenna performance—electrical and mechanical—the answer to your search **for effective power gain**—transmitting and receiving!

SPECIFICATIONS

5.2 gain compared to 1/4 wave ground plane
Frequency coverage - 143 to 149 MHz
SWR at resonance - 1.2:1 or better
Bandwidth for 6 MHz - 1.5:1 or better
Power Rating - 200 watts FM
Radiator - 85" consisting of 1/4 wave lower section, phasing transformer and 5/8 wave upper section

MODEL CGT-144—Easy—no holes to drill installation with trunk lip mount on side or edge of trunk lid. 180 degree swivel ball for optimized vertical positioning of antenna. Stainless steel radiator. Includes 17' MIL SPEC RG-58/U coax with all connectors attached. Antenna is removable from mount.

MODEL CG-144—Antenna supplied with 3/8"-24 base to fit all standard mobile ball mounts (mount or cable not included).

CG-144

CGT-144

AVAILABLE FROM ALL DISTRIBUTORS
WHO RECOGNIZE THE BEST!

THE QUICK – QUICK DISCONNECT

MODEL QD-1—For easy press and twist removal of your two meter colinear or Hustler HF mobile, add this assembly between antenna base and mount. It's 100% stainless steel, rugged and precision.

QD-1

new-tronics corporation

15800 commerce park drive,
brook park, ohio 44142

W2FJT	26	Sneaky Fast Scan Monitor for SSTV
K6ZN/W6GXN	31	Behold! – Super Key
WB8DQT	46	What Time is the Next Satellite?
W3HUC	54	CQ OSCAR 7
WA4WDL	62	How to Find a Satellite
K2OAW	65	Measuring Heating Oil Usage
WA2KHK	68	Mod Squad Hits the SB-102
VE3DNR	70	FM vs. AM – which is really better?
W1HCI/W2EDN	76	Build Your Own Repeater – for only $365
K9WQY	90	The Heath SB-103?
W2FJT	93	Get into a Grey Mood – Generate
WAØABI	96	Instant Neutralization
K7NZA	99	Phoenix Hams Show How It's Done
WN7KUD	108	Oh, the Lost Art of Diplomacy
W6GXN	111	Further Adventures of the Bounceless Switch
DJØHZ	115	Is Automated CW Possible?
W8YEK	120	100 Countries on SSTV
W7CSD	123	Joys of the One Night Stand
WA5KPG	129	KOX for CW
W2BJB	137	Quick Capacitor

73 amateur radio

#173 FEBRUARY 1975

COVER: Gene Kundert W8YEK (page 120).

2 Never Say Die W2NSD/1
3 Hotline Headlines
4 Looking West
5 Novice
5 Traveling Ham
6 SSTV Scene
8 Repeater Update
10 Surplus
11 AMSAT
11 Solid State
13 Ancient Aviator
14 50 MHz Band
14 QSL Contest
15 FCC: Docket 20282
22 Letters
88 Social Events
88 Ham Help
134 Caveat Emptor
148 Voxpoop
159 Advertiser Index
159 Propagation
160 Grrreen

73 Magazine is published monthly by 73, Inc., Peterborough, New Hampshire 03458. Subscription rates are $8 for one year in North American and U.S. Zip Code areas overseas, $9 per year elsewhere. Three years, $16 and $17 overseas. Second class postage paid at Peterborough, New Hampshire 03458 and at additional mailing offices. Phone: 603-924-3873. Microfilm edition of 73 available from University Microfilms, Ann Arbor MI 48106. Magnetic tapes available from Science for the Blind, 332 Rock Hill Rd., Bala Cynwyd PA 19904.

Entire contents copyright 1975 by 73 Inc. Peterborough, NH 03458.

73 Staff

EDITOR/PUBLISHER
Wayne Green W2NSD/1

BUSINESS MANAGER
Virginia Londner Green

EDITORS
Alex Barvicks WB4RVH
John Burnett

PRODUCTION MANAGER
Lynn Panciera-Fraser

PRODUCTION
Bob Drew
Nancy Estle
Cathy Greenwood
Bill Heydolph
Neal Kandel
Bob Sawyer
Rod Tulonen
Barbara Walker

PRINTER
Biff Mahoney

ADVERTISING
Bill Edwards WB6BED/1
Karen Hebert

COMPTROLLER
Knud E. M. Keller KV4GG/1

MARKETING
David A. Behnke
Stan Epstein

CIRCULATION
Barbara Block
Dorothy Gibson
Diane Grophear

TRANSPORTATION
Bill Barry
Paul Krulis
Jeff Riley

ASSOCIATES
Schley Cox WN9LHO
Tom DiBiase WB8KZD
Terry Fox WB4JFI
Dave Ingram K4TWJ
Joe Kasser G3ZCZ
Bill Pasternak WA2HVK/6
John Schultz W2EEY
Walter Scott K8DIZ
Peter A. Stark K2OAW
Bill Turner WAØABI

DRAFTING
T. M. Graham W8FKW
Bill Morello
Lynn Malo
Wayne Peeler K4MVK

Interior decoration by Henderson's Creative Work

EDITORIAL BY WAYNE GREEN

RESTRUCTURING HAS ARRIVED!

The FCC docket proposing sweeping changes in our rules is reprinted in full in this issue. Instead of telling you what it says, it will be better if you take the time to read the whole docket through carefully — making notes as you go — and consider it as a whole.

Many amateurs will find one or more parts of the proposals which will be objectionable. Though this may be like trying to hold back the incoming tide, it is suggested that you make every attempt to view the proposed rules in the context of an overall pattern and try, as best you can, to overlook any ways that you, with your present grade of license, will be affected. Keep in mind, as much as you can, that the FCC has written these proposals with the view of having a set of rules which will achieve certain ends:

More amateurs instead of fewer. True incentive to upgrade tickets. Minimum impact on present licenses.

In evaluating the docket, it is suggested that references to CB operation only be used if you have been an active CBer and really know what you are talking about. Draw upon your personal knowledge, not what you've read or been told. The fact is that there has yet to appear any honest evaluation of CB operation in the amateur press. The same reservation holds with respect to popular biases for and against Novices, Techs, Conditionals, and such. In your comments draw upon *personal experience,* and try to keep perspective.

It will take a lot of discussion over the air, at radio clubs, and with friends to develop a rounded and clear understanding of the docket and its ramifications such that you will be able to comment and make suggestions intelligently.

It looks as if we will get a good shake on this one — unlike the "incentive licensing" disaster which was turned over to someone with no understanding of amateur radio to be developed — and which failed utterly — making this docket necessary. We have five months leeway to work out our responses to 20282, so let's get working on it.

QRP LICENSE PETITIONED

RM2463, filed with the FCC, requests that a new class of license be set up which would avoid all math calculations. It would have a 5 word per minute code exam and a simple test for rules, CW operating procedures and basic CW theory. Privileges would include 5 or 10 watts power in a small segment of a seldom used part of a band . . . perhaps the lower part of 10m.

Having recently made a set of cassette tapes of the Novice theory as well as the five words per minute code tapes, I think I can say that the present Novice exam is pretty damned simple. I note that kids of 9 and 10 years are able to pass it and I really wonder how many people are really unable to cope with this simple exam. W9EHR/7, who submitted the petition, says that this class of license was inspired by his work with older people and that many of them are unable to make the arithmetic calculations called for on the Novice exam. He feels that many older people don't even try for the Novice license because they don't have a high school education . . . and he feels that amateur radio would be a great blessing for these lonely people.

Undoubtedly amateur radio has a lot to offer lonely people, if only we could get the word to them and get them interested enough to try it. But do we need to simplify the Novice test for this?

WHAT CAN I DO . . . ?

A great many amateurs are concerned over the steady drop in the number of radio amateurs and feel that something should be done about it — but they are frustrated — for after all, what can one individual do? The fact is that just a handfull of seriously interested amateurs could do a lot and could easily turn the whole situation around.

The circumstances that have gone

into making the situation we have today are mostly the result of neglect – of apathy. "Incentive licensing" may have hurt us a lot more than many amateurs realize and the results are still with us.

Now, to get down to brass tacks, here are some ways of helping that can be undertaken by individuals:

1. Help your local ham club. What clubs can do to help will be covered later.

2. Help high school ham clubs. This means helping them to form, offering advice to youngsters, helping them set up license study classes, helping them get a club station going, etc.

3. Give talks. Civic groups are always looking for speakers – so talk to the Rotary, Lions, etc., about the benefits of amateur radio to the community and to the country. Talk to Boy Scout groups – invite them over to see your station – help them start a ham club. Talk to CB groups.

4. Sport a bumper sticker which says, "Ask Me about Ham Radio." You'll get action from CBers and others.

5. You can spark interest on the air on the low bands or via repeaters if you organize a code practice broadcast – a theory broadcast, perhaps with Q&A afterwards. Perhaps you can set up a beacon to help VHFers know when the band is open. Or perhaps you can broadcast news bulletins of interest to amateurs such as are published in the Hotline and other ham newsletters.

HOW CAN CLUBS HELP?

1. Demonstrations set up in shopping plazas to interest people. This can be followed up with a pamphlet explaining the benefits of amateur radio as far as a career is concerned – as an antidote to loneliness – and for fun. Club bulletins giving info on club meetings and study classes can also be used to follow up leads.

2. Demonstrations at high schools. Half of the Novices last year were 14 and 15 years old. This is where the career pitch can be particularly valuable in attracting new blood.

3. Get license study classes set up with code practice, theory talks, Q&A sessions.

4. Get prospective amateurs to come to club meetings and study courses by means of those demonstrations – ads in the local papers – posters in the radio stores – posters in high schools – publicity on the radio

Continued on page 135

HOTLINE HEADLINES

. . . late breaking news for the active radio amateur . . . in summary.

OSCAR 7. The launch was successful and much DX is being worked via O7. **Couple Murdered?** Amateur radio reports responsible for helping catch a woman involved with possible murder of boating couple at Palmyra Island. **CARF Opposes GRS Skip Proposal.** The Canadian Federation filed in opposition to the proposed plan to permit Canadian CBers (GRS) work skip and hobby on 11m. **Aviation Week Oscar Article.** October 28th issue has a great article on Oscar 7. **KC4NI Makes It.** Navassa Island active again as W2 group fired up. **FKØ DXpedition.** California group active from New Caledonia. Previous stop was Wallis as FWØ. **Most Wanted DX List.** Top DXers need Clipperton, Bouvet, So. Sandwich, etc. **Restructuring News.** Communicator Class license certain now – Conditional to be non-renewable – new calls. **Truck CB Prohibition.** The ICC proposes to prohibit CB in trucks! May be able to get away with this. **Police CB Licenses Issued!** State police heading for massive installation of CB units – 2000 in Illinois alone – Smoky may, soon talk back – and bite. **WR Calls Mandatory Soon.** FCC will soon require all repeaters to have WR call if they are to continue to operate. **Sun Spot Madness.** 73's expert Nelson predicts incredible events for the next cycle. **New ID Plan Proposed.** Standardized tone for ID of 102 Hz so it can be filtered out by receivers when not needed. **CB Dealers Fight 20118.** Dealers and manufacturers furious over CB linear outlaw rule. **Oregon CB Couple Caught.** CB was used in the bomb threat and direction finding units located them. **License Fees.** New wrinkle – FCC license fees may be dual taxation and thus illegal. **FCC Sideband Policy.** Standards for unwanted sidebands which seriously effect 3999ers and other band edge ops released. **Clegg Synthesizer.** Details released on the new Clegg rig – looks fantastic. **Clegg Contacts Coordinators.** Clegg is working with frequency coordinators before shipping repeaters to make sure channels have been cleared. **ARRL Elections.** All incumbents elected again. Ho hum. **Jordan Off VE Banned List.** The recent visit of JY1 to Canada helped to clear the red tape and make it possible for Canadian amateurs to contact JY stations. **Direct Mail Sales Gaining.** Genave switch to mail order was successful – many other firms considering the switch. **QST Printing Costs Up.** The ARRL reported that costs have risen about 33% in 1974 over the same period in 1973. Loss in third quarter was a reported $45K! **Amsat Oscar 7 Covers.** First day stamped covers available for collectors. **Electronic Design Apologizes.** Their boo-boo labeling CBers as hams brought an apology. **Dallas War Chest.** The DARC is getting ready for a fight against a local tower ordinance – asking for contributions. **W8YEK Makes 100C on SSTV!** The first 100 country slow scanner. **FCC.** Caught in sneaky "editorial revision." **Law of the Sea Conference Fails.** Oceanus prospects better. **DX Advisory Committee Changes.** ARRL committee gets four newcomers. **New Country Soon?** Hutt River Province Principality applies for ITU sanction. **New IRC Coupons Issued.** Old ones will be good for two years. **New FCC Prefix Issued.** Look for WD6's – honest. **IFRB Study of HF in Progress.** Report due ITU later this year, key to possible new bands. **Alien Licensing.** Senate bill 2457 has passed Congress and awaits Presidential signature. **Flying Magazine Ham Article.** Stresses autopatch 2m repeater operation. Many alarmed. **A5 Magazine in Trouble?** Another specialized ham magazine folding? **ATV Repeater DX.** WA3BIB works into Washington from 70 miles out. **VE3AHU Awarded Trophy** for work in building CARF.

Bill Pasternak WA2HVK/6
14725 Titus St. #4
Panorama City CA 91402

It's hard to be objective when I write about the Palisades Amateur Radio Club and the many things that we accomplish. In the past I tended to avoid writing about P.A.R.C. inasmuch as I am very involved in the club and my remarks would tend to be anything but impartial. However, any radio club that brings along it's own repeater, complete with voice ID and special call sign, more than deserves a mention here. When we realized how many P.A.R.C. people were planning to attend the San Diego Convention, the idea of a portable repeater on the .01 – .61 WR6ABB channel was born in the mind of Fred Deeg K6AEH now P.A.R.C.'s Vice President. Fred applied for and was granted the Special Events Call sign WR6FM for use at the convention. Neil McKie WA6KLA, who might know more about Motorola two way FM equipment than the people that designed it, put a Motrac, a Mocom, my Norelco Carry-Corder and a few other pieces of peripheral equipment together and made an instant repeater with better coverage than the .34 – .94 official convention talk-in machine. (I personally tried both and .01 – .61 was usable for a greater distance than .34 – .94.) Did WR6FM get use? When a radio club full of .01 – .61 users invades an Amateur Radio Convention what would you think? Next stop is S.A.R.O.C. and hopefully WR7FM.

There is a growing trend on Southern California repeaters, ones of the non club sponsored variety, toward formation of user representation groups. These are amateurs who have organized to provide financial support to their favorite repeater while leaving matters of technical performance and operating practices to the discretion of the licensee. Organizations such as the Mt. Wilson Repeater Association and Mt. Lee Repeater Association coordinate monetary donations, user technical assistance to the licensee and social functions amongst themselves. One of the matters discussed at length at the Southern California Repeater Association meeting held at the San Diego Convention was the official recognition of these groups by S.C.R.A. and granting them voting privilege. Though a number of different plans were offered in this direction, it was decided that giving user vote in an organization designed to coordinate repeaters and the needs of their owner/licensees/trustees might tend to undermine the organization in the future. At the moment it is the repeater owner who is responsible in the eyes of the FCC for his system (though 20112 will substantially change this) and it is felt among the majority of repeater owners attending this meeting that any decisions that affect their respective systems are theirs alone to make. Therefore, such user groups can only remain as non-voting associate members. While this gives them and any other interested associate member a voice in any debate on any question, it will remain to the voting members, the repeater owners and licensees to make any final decisions.

About a year ago, the hottest controversy in the Los Angeles FM world was if a .34 – .94 repeater could survive in an atmosphere divided heavily pro and con. Those opposing it went as far as starting a group then called "Save our Simplex" to oppose it. It seems that all the controversy was for naught since, after a few tests, WR6ABO never went into full time operation. After waiting about nine months, six months more than necessary under the S.C.R.A. rules, the sanction of WR6ABO was cancelled by the S.C.R.A. Technical Committee due to total inactivity. Whether anyone else will apply for it in the future is in doubt. It's one of those hot-potatoes, as is .16 – .76. However, the latter has been sanctioned to the San Diego area and it will be interesting to see the reaction when that system gets into operation. In the L.A. area, and here in the San Fernando Valley especially, 146.76 is a heavily used simplex channel 24 hours a day. If care is taken to keep its signal out of L.A. proper it may well survive with little opposition.

When the S.C.R.A. was formed two years ago, there were so many pressing problems locally that our neighbors "South of the Border" were all but forgotten. At that time there was little FM activity and no repeater operation in that area. But times change and so do the needs of amateurs everywhere. Mexico is a very dramatic example of this. Our XE brothers have discovered the advantages of FM Repeater operation and are busily at work setting up a band-plan along with a number of wide coverage machines to provide coverage from the border on South. One of the most important needs of the Mexican amateurs to implement this communication system was a couple pairs of standard 30 kHz channel allocations; ones that would not interfere with or be interfered with by existing Southern California repeaters. By reshuffling a couple of existing smaller repeaters to either shared or split channels, our XE neighbors now have at least one of the two allocations they requested and the second will be following in short order. Looking West would like to hear from the amateurs in Mexico to know how their work is progressing.

Finally, as of this writing, December 1, 1974, none of the split-split allocations for Southern California have been officially designated, so it will be a little time yet till we can let you know how well things are working. As soon as we know, you will know.

Not long ago I was forced to report the demise of the open autopatch function on the WR6ACK repeater in West L.A. While ACK was the first attempt at such a service, another such system has come into existence and from all reports is having far less trouble than did ACK. Operating on 147.72 – 147.12 is WR6ADH in its home in the Montery Park area of Los Angeles. ADH offers better coverage, both radio and telephone dialing area than did ACK and has been quite lucky in that the phone-freaks have left it alone to grow. On the ADH system, you can call from Malibu on the west to Fontana on the east; Newport Beach on the south to Palmdale on the north. In fact, there are few areas that you cannot call, and over a hundred dialing prefixes are toll free. Anyone desiring more information on the WR6ADH autopatch system should send a SASE to WR6ADH, P.O. Box B, San Gabrial, California 91778. They will supply you with an informative letter that goes into far more detail than I have room for here.

As you read this in February, another meeting of the Southern California Repeater Association will be taking place. If you read this before February 2, and want to see how a well organized repeater coordinating organization is run, the time

is about 10 AM at the Belvedere Park Gym in East Los Angeles. The mid-February issue of HOTLINE will carry the highlights and a complete update will appear in April Looking West. Oh yes, the Mt. Wilson Repeater Association will be host for this S.C.R.A. meeting.

...de WA2HVK/6

Schley Cox WB9LHO
1613 Culbertson Avenue
New Albany IN 47150

LESS IS BETTER

Some Novices can't wait to put away their key when they get their General ticket. For them CW operation has become a horror to be endured at the insistence of the FCC.

Other Novices learn to appreciate CW for what it can do and find themselves at home with either a key or a mike when they upgrade their ticket. One group probably learned the proper use of abbreviations and Q-signals; the other one didn't.

Consider the two following statements. (A) THANK YOU FÓR THE CALL OM // YOUR SIGNAL RST IS 569 569 AND MY QTH QTH IS NEW ALBANY, INDIANA NEW ALBANY, INDIANA // NOW BACK TO YOU . . .; and then; (B) TU RST 569 QTH NEW ALBANY, IN // HW? . . .

The statement (A) may sound a little friendlier at first than (B) but it contains 77 more characters. It takes three times as long to send. If a CW operator carries on a conversation spelling out every word, repeating almost every other word and being redundant with the Q-signals, it won't take long for him or her to decide that a microphone is the only way to go in amateur radio.

There's no need to send "MY QTH IS . . ." because sending "QTH" means "My location is . . ." Sending it the first way actually means "MY MY LOCATION IS IS . . ." That sounds silly when you read it that way but many amateurs (not just Novices) send four extra characters every time they tell someone where they are.

How about "YOUR SIGNAL RST IS 579"? "RST 579" means the same thing and is a lot shorter to send: A little savings here and there begins to add up.

"WHAT KIND OF ANTENNA DO YOU HAVE?" could be sent "WHATS UR ANT?". "WELL I GUESS I HAVE RUN OUT OF THINGS TO SAY HERE" could be sent "QRU".

An efficient CW operator, whether sending at 5 or 25 wpm, avoids sending what is already obvious. What do the numbers 40475 or 80816 mean to you? Of course they are ZIP codes. There is no need to send "ZIP HR IS 40475." Just send the numbers after the address. The operator on the other end will understand.

Once you get the preliminaries out of the way, rag chewing can go a lot faster and be a lot more enjoyable if both operators use some common abbreviations and techniques.

Keep a list of CW abbreviations and Q-signals at your operating table. Try to use them as much as possible while keeping your meaning clear.

A little on-the-air experience will tell you if you need to repeat your location or name in order for the operator on the other end to copy you most of the time. If you live in Chicago, there's no need to send "QTH CHICAGO, IL CHICAGO, IL". Most operators will know where you are the first time around. If they don't they can send "QTH?".

If you live in Paoli, IN or Florissant, CO or someplace with a less than common name, some on-the-air experience may tell you that you should repeat the name so that the operator on the other end won't have to wonder if he copied correctly.

Despite urges to adopt some nickname like "Rocky" or "Bob" I stick with my given name on the air. I send "NAME SCHLEY SCHLEY OM". The operator on the other end can check his copy with the repeat and not have to worry about my gender.

If you can think of a way to shorten how you say what you have to say on CW you may find that your key, keyer or bug gets to stay on your desk next to your mike when you drop the N.

If you have a particularly good (or bad) experience getting your Novice ticket, waiting for it to arrive, learning the code, studying for the written test, or setting up a station, let me know. I would like to get some information together for a column or two on preparing for the test and setting up that first station.

If you have an idea for a topic you would like to see discussed here drop me a line (or better yet, send an amateur radiogram). GL ES HPE CU SOON.

Joe Kasser G3ZCZ
1701 East West Highway, Apt. 205
Silver Spring MD 20910

The Traveling Ham

This month I'd like to continue with the listing of European repeaters.

Austria	
Gmundnerberg	R2
Klagenfurt	R4
Linz	R6
Patscherkofel	R2
Kufstein	R5
Kaiserkogel	R4
Krippenstein	R5

All these repeaters have call signs in which the first letter of the suffix begins with an X, (eg. OE5XGL).

The *French* licensing authorities have a new address: Direction Telecommunication Du Reseau International Service Radio Amateur, Immeuble PTT Bercy, F.75584, Paris, Cedex 12. This address is to be used when making enquiries about reciprocal operating.

This month's column is based on material published in the August 1974 issue of The International Amateur Radio Union, Region 1 News.

Two meter activity in Cyprus is on the increase, and last summer produced some good openings into Israel. Contacts were made almost every day and strong signals were heard both in Cyprus and in Israel, even from stations using hand held 1 W rigs. The calling frequency in Cyprus is 144.6 MHz. The propagation seems to be mainly due to tropospheric ducting. I can remember viewing TV programs from all over Israel and the Middle East when I was out in that part of the world, so two meters should be excellent.

Two meter activity is catching on strongly in Israel, up till quite recently there was very little interest in VHF in two meters because for political reasons there was very little DX activity on the band, but now with AMSAT-OSCAR spacecraft in orbit the DX aspects of two meters have suddenly increased enormously.

If you are going to *Denmark*, you can get a reciprocal operating permit by filing an application at least one

month before you need it. The application form may be obtained from: The General Directorate of Posts and Telegraphs, 1st Technical Office, 17, Farvergade, 1st Floor, DK-1007 KØBENHAVEN K. The fee to be paid for the license is D.kr.50.0 and it is to be paid by means of a special inpayment form, which is sent to the applicant together with the license. The fee shall not be paid until after the arrival of the applicant in Denmark. If the stay in Denmark is greater than a period of more than three months the usual application for a Danish amateur radio license should be sent in. The Danish repeaters were listed in the last traveling ham column.

The two meter scene in *Italy* is also humming. There are nearly one thousand amateurs on two meter FM and they are planning a repeater chain to cover the whole country. Italy does have a reciprocal agreement with the other common market countries and last summer over 60 Europeans took advantage of that agreement to obtain permits to operate in Italy. Most of those were from West Germany. For prefix hunters the IW prefix identifies stations having a "Technician Class" license who are permitted to operate on frequencies above 144 MHz with a maximum input power of 10 W.

To those of you who sent in encouraging notes and QSLs, here are my thanks. It is nice to know that the long hours spent pecking away at the keyboard are appreciated.

...G3ZCZ

SSTV SCENE

Dave Ingram K4TWJ
Rte 11, Box 499 Eastwood Vil. 604 N.
Birmingham AL 35210

The WØLMD Digital Slow to Fast Scan converter is off and flying in fine shape. W8URX is producing printed circuit boards of the unit and sending them to Phil WA9UHV. Phil adds the printed information, sketches, layouts and distributes them to the interested parties that contact him. This Scan converter package consists of nine double sided printed circuit boards. Eight of these boards are the scan converter, and the ninth board is a test jig for checking surplus 1024 bit shift register ICs used in the unit's memory. The main expense in this scan converter is the 1024 bit memory ICs. Unless one owns a gold mine, these #2525 or #2504 MOS shift registers must be purchased surplus. The good/bad ratio of these chips average 75/25, thus the test jig is very convenient for locating the good memory chips. Surplus 2525 MOS memories may be difficult to locate, so I suggest you secure these while planning a Slow to Fast Scan converter.

Possibly this scan converter business is confusing. Since these converter units are beginning to play a large role in the SSTV field, let's try to clear the air on them. There are two types of Digital Scan Converters: The Fast to Slow Converter and the (new) Slow to Fast Converter.

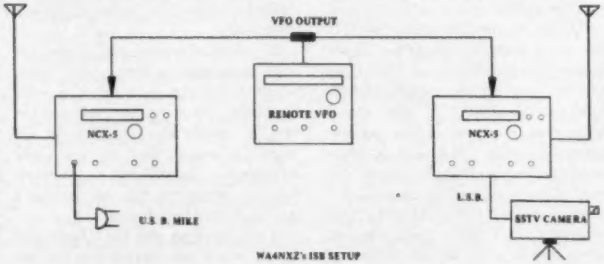
The Fast to Slow converter connects to any conventional (Fast Scan) camera and outputs directly with Slow Scan TV. No modifications to the camera are required. Two variations of this unit are presently available. The WØLMD unit appeared in August 1974 73 Magazine. Printed circuit boards of this unit are available for a nominal sum from K7OLO or W8OZA. W8OZA also handles the SSTV Keyboard information and PC boards. This unit appeared in October 1974 CQ Magazine. The other Fast to Slow Scan Converter is available directly from its designer, W6MXV. This unit may be purchased in either PC boards only (2), PC boards plus parts, or wired and tested PC boards. Prices range from approximately 30 dollars to 200 dollars. Both previously mentioned scan converters produce extremely good results.

The Slow to Fast Scan converter is new. Details on this converter have yet to appear in any magazine. This converter replaces an ordinary P-7 monitor. The unit connects between your HF receiver and a conventional (fast scan) television. No modifications to the television are required. The incoming SSTV is then displayed as large, bright pictures. Memory circuits allow the last frame received to be indefinitely displayed on the TV screen. Although this unit is perfected, and works beautifully, it is still undergoing refinements by its SSTV designers. Meanwhile, as previously mentioned, information and PC boards are available from Phil WA9UHV.

Bob W9LUO of SSTV fame. I'm sure many of you know of his "W9LUO Monitor."

Volunteers Needed

As you may have noticed, weekends of major contest activity play havoc with Slow Scan TV communications. Many contest operators are congenial, understanding people who simply are not informed of SSTV work. A volunteer is needed to contact the major contest committees and relate the role SSTV plays in pioneering communication technology, plus relate the popular SSTV frequencies. We also need someone with time to write guest editorials of Slow Scan. operations and to request special frequencies (like 14.190 MHz) for SSTV use. The end results should yield more respect for on-the-air SSTV operation. If you would like to handle the task



WA4NXZ's ISB SETUP

and need assistance, drop me a cassette tape or meet me on 14.230 kHz Saturdays around net time.

Newsy Happenings

Henry WA4NXZ is operating Independent Sideband using a pair of NCX-5's slaved to one remote vfo. He pulled the oscillator transistors from each rig and fed the remote vfo signal to both transceivers. One NCX-5 was switched to upper sideband and the other NCX-5 was switched to Lower Sideband. Henry is building a four-811 linear which will have the capability of operating all four tubes on audio or video — or switched to operate two 811's on voice and two 811's on video. The linear's output will feed one antenna.

Although WB5IXK didn't submit a log last year, he placed second in the world-wide Slow Scan TV contest. He used a felt pen and fast hand to rack up a high score. I understand that he will be operating a SSTV Keyboard this year. Hmmm quite a few fellows are beginning to build PC board circuits. BRAVO!

KH6HJF has been transmitting SSTV to several JA's via Oscar, but still awaits a two way Slow Scan QSO via the satellite.

W2DD, an old time SSTVer, is now writing the SSTV column in World Radio News.

W6EYY reports that Slow Scan activity in Japan is steadily increasing. JA activity is heard between 0530 and 0700 GMT around 14.230 MHz, and on 21.340 MHz between 2200 and 0100 GMT. His list (in this month's column) of JA's worked on SSTV is a nice guideline of Japanese stations presently operating SSTV. Now you know who you should hunt.

JAØBZC	JA7FS
JAØCVF	JAØAXV
JA6DG	JA8ARA
JA1EOD	JA4ONU
KA2EI	JA7EYL
JA7GY	JH1HFE
JA8ACP	JA1VUI
JH1PZN	JA6ARW
KA2DF	JA2LVK
KA2MW	JAØOE
	JA2KB

List of Japan SSTV Stations worked by W6EYY.

SSTV ADDRESSES

WA9UHV — Phil, 4012 Carmelita Blvd., Kokomo, Indiana 46901. Slow to Fast Scan Converter boards and info.

W6MXV — Mike, 6941 Lenwood Way, San Jose, California 95120. Fast to Slow Scan Converter Boards and kits.

W8OZA — Russ, 1411 Lonsdale Rd., Columbus, Ohio 43227. Fast to Slow Scan Converter and SSTV keyboard, boards.

K7OLO — Jim, 2930 Sorrel Way, Eugene, Oregon 97401. SSTV Keyboard info and boards and Fast to Slow Scan Converter boards.

SLOW SCAN CONTEST ANNOUNCEMENT

The yearly worldwide Slow Scan TV contest is happening again during the eighth and ninth of this month, and a large amount of activity is expected. This will be a joint contest with 73 awarding a year's subscription to the world winner. U.S. stations should send me, K4TWJ, a duplicate of their logs and scores to be eligible for the 73 award. Don't forget to include a photo with your results. We will run the photo (and contest results) in this column, then return it to you. Notice in the accompanying rules that past winners face a six per cent deduction handicap, and each U.S. call area is considered as a separate country. As usual, the information exchange (call sign, report and QSO number) must be via Slow Scan TV but audio IDs are permitted for FCC legality. Good luck, and we hope to "see" you in the pileups!. . .K4TWJ

World Wide SSTV Contest Rules

Sponsored by the cq elettronica and 73 Magazine.

The Italian Magazine cq elettronica and the American 73 Magazine have pleasure in announcing the 5th Worldwide Slow Scan Television Contest.

The purpose of this Contest is to promote increased interest in the SSTV mode of operation as used by Radio Amateurs.

RULES

1) PERIOD OF CONTEST

Part 1 15.00-22.00 GMT on February 8th 1975

Part 2 07.00-14.00 GMT on February 9th 1975

2) BANDS

All authorized frequencies within the 3.5-7.0 — 14.0-21.0 & 28.0 MHz bands.

3) MESSAGES

Messages will consist of: Exchange of pictures and also included are a) the call sign; b) report (RST); c) serial number.

The serial number must start at 001 and is increased by one for each successive contact during the period of the Contest and the serial number is irrespective of the Band(s) used.

Exchange must be made exclusively with the SSTV mode. For the "W" are accepted the FCC rules.

4) EXCHANGE POINTS AND MULTIPLIER

a) Contact score 1 point per contact on the 3.5, 7.0, 14.0, 21.0 MHz Bands. 2 points per contact on the 28.0 MHz Band.

b) A multiplier of 5 points for each Continent (Max 30 points) and 2 points for each Country (ARRL List) worked can be utilised on each band. In addition to the ARRL List will be considered as separate Countries the W call areas WØ to W9 and VE Call areas from VØ to VE7.

The same Continents and Country is only valid once on each Band. The same station can only be worked once on each Band (Max 5 contacts) during Contest period.

5) SCORING

Total exchange points multiplied by the multiplier total.

6) HANDICAP

Winners of precedent Contest: less 6% of the total final score.

7) SECTIONS

a) Entrants transmitting and receiving video.

b) Entrants receiving video only. For this purpose the same general rules apply and the same station heard is valid once only on each Band.

A separate results table will be made for each of these two classes of entry.

8) LOGS

Logs should contain: Date, Time of contact (GMT), Band in use, Call sign, Report (RST) sent and received. Serial numbers sent and received, points, multipliers and final score.

Although not essential, it would be appreciated if entrants could enclose a cover sheet with a short description of the Station (With photo if possible) together with any comments on the Contest.

All entrants are kindly requested to report on any serious Contest irregularities e.g Exchanges in other modes.

For entrants in the b. Classification it is only necesary to record the message of the station heard.

All Logs must be received by not later than March 25th 1975 in order to qualify.

Send them to:

Prof. Franco Fanti
Via A. Dallolio n. 19
40139 Bologna ITALY

9) PRIZES

1° A free 12 month's subscription to cq elettronica Magazine

2° A free 6 month's subscription to cq elettronica Magazine

3° A free 6 month's subscription to cq elettronica Magazine

10) RULES OF BEHAVIOUR AND PENALIZATION.

The Logs must be compiled in accordance with the Rules listed in (7). The contacts must be made by means of the SSTV mode and it is not permitted to use other mode of transmission either before, during or after the exchange of message by Slow Scan TeleVision.

During the Contest it is expected that Amateurs will observe the fundamental rules of courtesy and good operating during contacts.

Failure to observe any of the above Rules will result in the exclusion of the entry from the final results and any such Logs received will be considered as check Logs.

All Logs received become the property of the Edition CD and will not be returned.

The decision of the organising Committee in any dispute will be final and any subsequent controversy cannot be referred to the Civil Court.

* – New
† – Change
D – Delete

ALABAMA

*WR4AJN	Demopolis	146.04	146.64
*WR4AJF	Dothan	146.25	146.85
*WR4	Eufala	146.19	146.79
*WR4	Evergreen	146.16	146.76
†WR4AEZ	Gadsden	146.22	146.82
†WR4AGI	Gadsden	146.37	146.97
*WR4ADX	Headland	146.16	146.76
†WA4UAG	Huntsville	CLOSED	
*WR4AQB	Mobile	146.10	146.70
*WR4AHQ	Mobile	146.22	146.82
†WR4AJH	Montgomery	146.34	146.94
*WR4AKM	Opp	146.04	146.64
†WR4AIC	Phenix City	146.28	146.88
*WR4AHH	Troy	146.22	146.82

ARIZONA

*WR7AEK	Casa Grande	146.37	146.97

ARKANSAS

*WR5AGS	Mountain Home	146.28	146.88

CALIFORNIA

†WR6AHK	Alamo	147.66	147.06
*WR6ADI	Auburn	222.26	223.86
*WR6ABX	Berryessa Pk	223.22	224.82
*WR6AEN	Folsom	222.50	224.10
*KB1S	Folsom	222.96	224.58
*WR6AFN	Kensington	223.26	224.86
*WR6ADC	Marin	222.10	223.70
*WR6AEE	Montebello Ridge	223.34	224.94
*WA6ZUB	Mt San Bruno	223.06	224.66
*WR6AFU	Mt St Helena	222.42	223.62
*WR6AHD	Mt Umunhum	147.795	147.195
†WR6ABH	Mt Umunhum	147.75	147.15
†WR6ABH	Mt Umunhum	222.02	223.62
†WR6AEI	Mt Vaca	147.87	147.27
*WR6AQO	Mt Vaca	222.34	223.94
*WR6AGJ	Mt Vaca	CLOSED	
†WR6ADW	Otay Mtn P	147.09	147.39
*WR6AFL	Point Loma P	147.99	147.39
*WB6ZGT	Shingle Springs	CLOSED	

COLORADO

*WR8AGN	Black Forest	146.19	146.79

CONNECTICUT

*WR1ADT	Farmington	146.37	146.97
†WR1ABD	Groton	146.07	146.67
†WR1ABR	Stamford	146.055	146.655

FLORIDA

D–WR4ACV	Boca Raton	146.34	146.94
*WR4ACV	Boca Raton	146.34	146.82
*WR4	Fernandina Beach	146.01	146.61
†WB4ZAY	Ft Myers	146.28	146.88
*WR4	Ft Pierce	444.0	449.0
*WR4	Jacksonville	146.07	146.67
*W4FWV	Miami	146.40	147.00
*WR4AHN	North Dade	CLOSED	
*WR4AGW	Orlando	146.04	146.64
*WR4AJM	Orlando	146.19	146.79
†WR4AEQ	Orlando	146.58	147.18
†WR4AER	Orlando	147.72	147.12
*WB4KI	Pensacola	444.6	449.6
†WR4AGO	St Petersburg	CLOSED	
*WR4AGP	St Petersburg	CLOSED	
*WB4HAE	Tampa	146.25	146.76
*WR4	Tampa	146.28	146.88
*WR4	Tampa	147.63	147.63
*WB4QEN	Tampa	444.1	449.1
*WR4AKX	West Palm Beach	146.34	146.94
*WR4	West Palm Beach	146.37	146.97
*WR4	Winter Garden	146.34	146.94

ILLINOIS

*WR9	Chicago	223.38	224.98
*WR9ADO	Chicago	147.78	147.18
*WR9AER	Sterling	146.25	146.85

INDIANA

†WR9ABD	Evansville	52.92	52.575
*WR9ABN	Fort Wayne	147.60	147.00
†WR9ABA	Indianapolis	146.10	146.70
*WR9AEP	Indianapolis	147.66	147.06
†WR9AEK	South Bend	146.34	146.94
*W9EZS	South Bend	146.70	146.10
†WR9AEL	South Bend	147.93	147.33
†WR9AEF	Wabash	147.63	147.03

IOWA

†WR8ACO	Ames	146.16	146.76
†WR8ACF	Ayrshire	146.22	146.82
*WR8AGJ	Cedar Rapids	CLOSED	
†WR8AQM	Cedar Rapids P	147.69	147.09
†WR9ABY	Clarinda	146.37	146.97
†WA6HLM	Clinton	146.07	146.67
†WR8AQK	Creston	146.10	146.70
†WR8AEB	Davenport	146.04	146.64
*WR8	Davenport	146.28	146.88
†WR8AEZ	Des Moines W	146.34	146.94
†WR8AFN	Des Moines	146.22	146.82
*WA8ITC	Des Moines	449.50	444.50
*WR8	Knoxville	146.13	146.73
*WR8AEY	Sioux City	146.37	146.97

KANSAS

*WR8AGO	La Cresse	146.16	146.76

KENTUCKY

*WR4AJW	Louisville	146.67	146.67
*WR4AKI	Somerset	146.28	146.88

LOUISIANA

†WR5AEN	New Orleans	CLOSED	
*WR5	New Orleans	146.04	146.64
*WR5	New Orleans	CLOSED	
*WR5	New Orleans	CLOSED	

MARYLAND

*WR3AEK	Suitland	444.40	449.40

MASSACHUSETTS

*WR1AEB	Barnstable	146.13	146.73
†WR1AEO	Brookline	CLOSED	
†WR1ADA	Charlton	146.28	146.88
†WR1AEK	Fitchburg	146.46	147.46
†WR1ABK	Foxboro	146.355	146.955
*WR1ABZ	Holliston	147.855	147.27
*WR1ADG	Lexington	147.795	147.67
†WR1AFI	Mt. Greylock	146.31	146.91
†WR1AEH	North Adams	146.43	147.03
*WR1AAI	Quincy	146.07	146.67
†WR1ACR	Somerville	146.145	146.745
†WR1ACM	Stoughton	146.175	146.775
†WR1AEF	Westfield	146.10	146.70

MICHIGAN

†WR8AEC	Detroit	147.96	147.36
†WR8AEZ	Detroit	147.96	147.36
†WR8ABN	Detroit	CLOSED	
*WR8ADK	East Tawas	146.34	146.94
†WR8AEE	Grand Blanc	449.2	444.2
†WR8AFR	Howell	222.50	224.10
*WR8	Mount Clemens	147.75	147.15
†WR8AEK	Tranary	146.16	146.76
†WR8ACY	Whitmore Lake	147.81	147.21
*WR8	Wyandotte	147.84	147.24
D–WR8	Wyandotte	147.75	147.15

MISSISSIPPI

†WR5AQG	Hattiesburg	146.22	146.82
†WR5AFN	Vicksburg	146.19	146.79

NEVADA

†WR7ABN	Virginia City/Reno	146.16	146.76

NEW HAMPSHIRE

†WR1ADY	Francistown	146.19	146.79

NEW JERSEY

*WR2AEA	Blackwood PL W1.8	146.22	146.82
D–W2FLY	Camden	146.22	146.82
†WR2ADB	Denville	CLOSED	
†WR2ADT	Greenbrook	146.34	146.94
†WR2ACS	Martinsville	CLOSED	
†WR2ADV	Paramus	CLOSED	
D–W62ZWG	South Jersey	146.22	146.82

NEW MEXICO

*WR5ADX	Alamogordo	146.22	146.82

NEW YORK

†WR2ACW	Bethpage	CLOSED	
†WR2AEL	Brasx	147.84	147.24
†WR2ACQ	Flushing	147.69	147.09
†WR2AFC	Hampstead	CLOSED	
*WR2AQC	Hudson	146.07	146.67
†WR2ABH	Huntington	CLOSED	
†WR2ABT	Huntington	CLOSED	
†WR2AFE	Manhattan	CLOSED	
†WR2ACC	Manhattan	146.07	146.67
†WR2AFQ	Manorhaven	CLOSED	
†WR2ADZ	Nassau County	CLOSED	
*WR2AGH	Oswego	146.16	146.76
†WR2ACB	Stonybrook	CLOSED	

NORTH CAROLINA

†WR4AKB	Manteo	146.34	146.94
*WR4AJX	Union City T1800	147.24	147.90

OHIO

*WR8AFG	Clermont County	146.28	146.88
†WR8ADB	Millersburg	146.07	146.67

OKLAHOMA

*WR5AGI	Altus	146.19	146.79

OREGON

*WR7ADJ	Pendleton	146.28	146.88

PENNSYLVANIA

*WR3	Canton	147.75	147.15
*WR3ADW	Indiana	146.31	146.91
*WR3	Whitehall	145.645	145.045
*WR3DEE	Williamsport	146.13	146.73

SOUTH CAROLINA

*WR4	Greenville	146.22	146.82
*WR4AJO	Rock Hill	146.43	147.03

TEXAS

*WR5AGE	Alice	CLOSED	
*WR5AGF	Kingsville (RTTY)	449.00	444.00

VIRGINIA

D–WR4ABR	Arlington	146.31	146.91
†WR4ADZ	Blue Mountain	146.37	146.97
†WR4ACN	Chesapeake/Norfolk	146.19	146.79
*WR4	New Market	147.93	147.03
†WR4AHT	Roanoke	146.34	146.94
*WR4AHT	Roanoke	447.75	443.75
*WR4	Suffolk	146.40	147.00
*WR4ABR	Tysons Corner	146.31	146.91
*WR4AEY	Tysons Corner	222.34	223.94
D–WR4AEY	Vienna	222.34	223.94
†WR4AGT	Winchester	146.22	146.82

WASHINGTON

*WR7ADX	Mission Ridge	146.07	146.67

CANADA

BRITISH COLUMBIA

†VE7KAR	Kamloops	146.34	146.94

NEW BRUNSWICK

D–VE1PD	Fredericton	147.90	144.225

NOVA SCOTIA

D–VE1ATN	Charlottetown	146.10	51.525

ONTARIO

*VE3MHZ	Brampton	146.28	146.88
†VE3SSM	Sault Ste Marie	146.34/146.46	146.94
†VE3TFM	Toronto	222.38	222.98
†VE3UKW	Toronto	449.40	444.00

PRINCE EDWARD ISLAND

†VE1ATN	Charlottetown	146.10	51.525

QUEBEC

†VE2SP	Alma	146.34	146.94
†VE2IU	Chicoutimi	146.10	146.76
*VE2CRA	Hull-Ottawa	443.2	448.2
†VE2AMN	Joliette	146.43	147.03
D–VE2ASU	N.D. du Buckland	146.70	147.60
*VE2UZ	Quebec	146.46	147.06
†VE2NY	Riviere du Loup	146.46	147.06
†VE2SS	Sherbrooke	146.52	147.50
*VE2CRT	Three Rivers	146.46	146.94
†VE2AT	Trois Rivieres	146.07	146.67

FOREIGN

ISRAEL

*4X4	Jerusalem	146.175	146.775

SWEDEN

*SK8	Skellefteo	145.10	145.70

DENMARK

†OZ3REJ	Ringsted	145.05	145.65

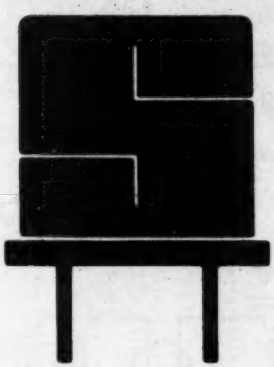
NEW ZEALAND

*ZL	Auckland	146.35	145.65
*ZL	Palmerston North	146.35	145.65
*ZL	Waikato	146.35	145.65
*ZL	Whangarei	146.35	145.65

AUSTRIA

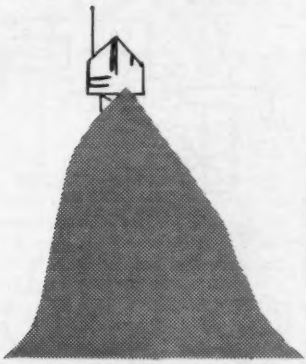
*OE	Gmundnerberg	145.05	145.75
*OE	Kaiserkogel	145.10	145.70
†OE7	Klagenfurt	145.10	145.70
*OE	Krippenstein	145.125	145.725
†OE7	Kufstein	145.125	145.725
†OE5XLL	Linz	145.15	145.75
*OE	Patscherkofel	145.050	145.650

. . . WB4RVH



REPEATER OWNERS

Don't Take Chances. SENTRY offers custom made crystals made exactly to your specifications. When it comes to crystals for your repeater, BUY THE BEST – SENTRY.



REPEATER USERS

If you want reliable access to the repeaters in your area, you want and need SENTRY CRYSTALS. SENTRY CRYSTALS are custom made for your rig. We don't stock a large quantity of crystals for a certain frequency and hope you can tweak them to frequency in your rig. We do offer FAST service on crystals made especially for you and your rig. If you want reliable, on-frequency operation, INSIST ON SENTRY.

SENTRY MANUFACTURING COMPANY
Crystal Park, Chickasha, Oklahoma 73018

PHONE: (405) 224-6780
TWX-910-830-6425

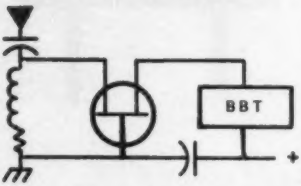
SURPLUS

Bill Turner WAØABI
Associate 73

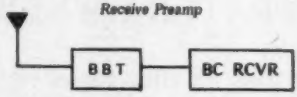
One of the more interesting items on the surplus market these days is a "broadband tuner," stock number RT-45, offered by Fair Radio Sales Co. Inc., 1016 East Eureka Street, P.O. Box 1105, Lima Ohio 45802. This item is stated as covering 14 to 50 MHz, but slight modifications in the form of adding shunt capacitance or rewinding the coil would allow coverage of about any HF/VHF frequency range you might need. As received, the unit is enclosed in a nice aluminum box measuring approximately 2" x 3" x 4" (50 x 75 x 100mm). The lower half contains an octal socket (intended for a 6SG7) along with an assortment of resistors, capacitors and chokes. A few minutes with screwdriver, soldering iron and hacksaw will reduce the 100mm dimension to about 60mm if space is critical.

Electrically this tuner is an ordinary parallel tuned circuit but mechanically it is definitely something else. The double bearing, 150 pF capacitor's rear shaft is extended approximately 40mm and is fitted with a 30mm diameter drum which is provided with a spiral slot. A pin rides in this slot and drives the ferrite slug of a 3/8" (9mm) coil mounted parallel to and below the capacitor shaft. As the capacitor shaft is rotated clockwise the plates unmesh and simultaneously the core is withdrawn from the coil. This combined action decreases both the inductance and capacitance and allows the tuned circuit to cover a much greater frequency range than would normally be possible.

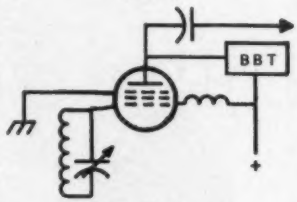
There are any number of uses to which this tuned circuit could be adapted. The original intent was to use it for a general coverage converter for a ham band only receiver but so many other uses have come to mind that I have bought several more to allow experimentation. The following may give you a few ideas of what you can do with this $1.95 item.



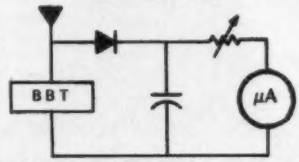
Receive Preamp



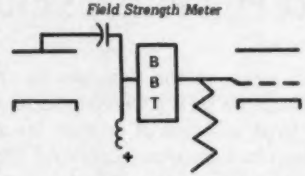
BCI Trap



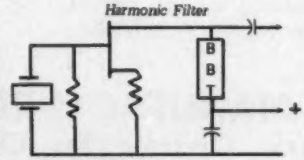
Harmonic Selector



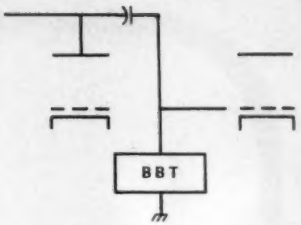
Field Strength Meter



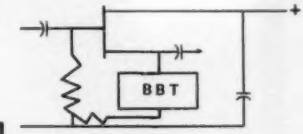
Harmonic Filter



Band Edge Marker



Interstage



Source Follower

Tri-Tek, Inc., P.O. Box 14206, Phoenix AZ 85031 has various items of interest to the builder, here are a few from their latest flyer. Round TO-5 transistor sockets, 14/$1; Sprague or Mallory electrolytics, 36,000 Mfd/15 V, $2.25 or 720 Mfd/150 V, $1.25. Miniature PC mount air variables 1.7-20 pF, 55¢; TO-3 mounting kit, all nylon, 10/$1; 8.3 Volt Zeners (1 W) use with a silicon transistor for 9 V supply 4/$1; NE-2 neons, 14/$1; red anodized TO-5 heatsinks, the good extruded type, 10/$1. How about ¼" x 1" (6 x 25mm) ferrite core choke (and coil) forms at 6/50¢? Building a time base or calibrator... could you use a 5.0000 MHz crystal made by Hughes... for $1.50? Need a transformer for a heavy duty power supply? Tri-Tek has one for $9.50 which will fill your requirements. These are brand new, fully jacketed and have 6 secondary windings, each rated at 6.4 V. Two are rated at 5 A and 4 at 2 A. By connecting these in series and/or parallel you can get from 6 V at 18 A to 38 V at 2 A... and many steps in between. Olson Electronics, 260 S. Forge, Akron, Ohio 44327 has some items of interest too. The current flyer lists a 12 V dc, 3 A power supply kit for $7.99 (normally $9.95) including the chassis, transformer, filter etc. Sounds like just the thing for the 2 meter rig. Also listed are a variety of meters including 0-1 mA, 0-150 uA and 75-0-75 uA each for under a dollar. For the linear builder Olson lists a 160cfm blower "used but works like new," for $3.99. These are 5¼" (130mm) diameter and are of the torrington variety.

...WAØABI

AMSAT NEWS

OSCAR 7

The satellite continues to do a splendid job. Mode A is operative on odd days and mode B on even days. Don't use it on Wednesdays please. It's on, but should be left alone.

A little rf interference has developed on a few of the telemetry channels (1A-2D).

The space-only on-off RTTY function is a normal one, but unpublicized previously. Please send in reports of TT contacts via this mode.

The 2m-10m signals have been heard from way over the horizon by several English ops and East Coast ops are asked to particularly keep an ear peeled for any European signals coming through on over the horizon passes. Reports on this will be appreciated.

The Oscar 7 QSLs are now being sent to those who furnish reports.

A German op heard a Spanish station coming through the 70/2m link and further information on this is hoped for soon.

Oscar 6 continues to work well and G3IOR reports that he has now made contact with 50 countries via the satellite! Amsat reports 87 countries so far reported via Oscar 6 and nearly 3000 users.

There are three new Amsat nets. One on Saturdays at 1000z on 14280, one on Sundays at 1015z on 3780, and one in London with net control G8CSI on 144.28 at 1730z.

Amsat reports that it has sent out a list of the predicted orbits for both satellites to everyone on their mailing list, complete with a list of some of the accomplishments so far. They also report that reprints are available of some of the tech articles from the Amsat bulletin with good info on equipment to use, modifications of equipment, and how to work through the satellites.

HR report erroneously said Amsat had some slides of the project – these are available, but from ARRL, not Amsat.

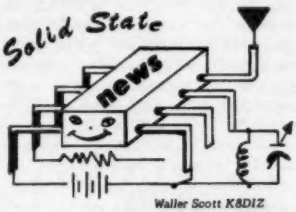
The mailing address for Amsat is: Amsat, P.O. Box 27, Washington DC 20044.

OSCAR 6 ORBITING DATA

A little study of these figures should allow extrapolation of times for future dates.

Orbital Information

Orbit	Date (Feb)	Time (GMT)	Longitude of Eq. Crossing °W
10498	1	0042.5	59.1
10511	2	0137.4	72.8
10523	3	0037.4	57.8
10536	4	0132.3	71.5
10548	5	0032.2	56.5
10561	6	0127.2	70.2
10573	7	0027.1	55.2
10586	8	0122.0	69.0
10598	9	0021.9	53.9
10611	10	0116.9	67.7
10623	11	0016.8	52.7
10636	12	0111.7	66.4
10648	13	0011.7	51.4
10661	14	0106.6	65.1
10673	15	0006.5	50.1



Waller Scott K8DIZ
7318 Hollywood Drive
West Chester OH 45069

Voltage regulators are required in many solid state circuits today to compensate for the effects of varying line voltages. Also, regulators allow use of power supplies with poor load regulations for non-critical parts of a circuit, and the addition of regulation to only those portions requiring a stable power source. Regulators with built-in short circuit protection provide some protection for the main power supply as well as the load circuit.

A very useful series of ICs has been introduced by Fairchild. This is the 78L00 series of 3-terminal positive voltage regulators. These regulators employ internal current limiting and thermal shutdown, making them essentially indestructible. If adequate heat sinking is provided, they can deliver up to 100 mA output current. They are intended as fixed voltage regulators in a wide range of applications including test equipment, on-board regulation for elimination of noise, solving distribution problems associated with single point regulation, and general purpose power supply use. In addition, they can be used with power pass elements to make high current voltage regulators. The 78L00 used as a zener diode/resistor combination replacement, offers an effective output impedance improvement of two orders of magnitude, along with lower current.

Typical output voltage change is 1% with input voltage variations, and 1% with from 5 mA to 100 mA load current variation. Available output voltages are 2.6, 5, 6.2, 12, and 15 V dc. The units are available in either ± 5% or ± 10% voltage tolerances. Maximum input voltage is 30 V except for the 12 and 15 V devices which are rated at 35 V dc.

The superiority of the 78L00 compared to the standard 400 or 500 mW zener (1N746 or 1N5221 series) is shown in Fig. 1. The resistor/zener combination can supply a load current of 17 mA with a quiescent current of 20 mA, while the 78L00 can couple up to 100 mA of load current with a quiescent current of 5 mA. At 5 mA the temperature coefficient of the 78L00 output voltage is equal to or better than the zener and output noise voltage is reduced when using the 78L00 series.

This regulator is available in a TO-39 metal and the more common TO-92 plastic package. The 3-lead plastic package is available from your Fairchild distributor as the 78L12WC (12 V version – last digits indicate voltage and tolerance) for $.75 in single quantities.

For higher current requirements, Motorola has a series of 3-terminal voltage regulators for both positive (MC7800C series) and negative voltages (MC7900C series). The 7800 series of fixed positive regulators is available in voltages of 5, 6, 8, 12, 15, 18, and 24 V. The 7900 series is

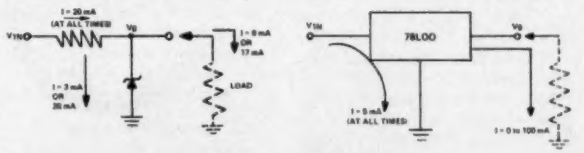
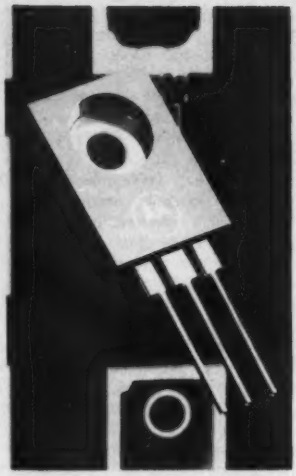


Fig. 1. Regulator Comparison



MC7800 & MC7900 Regulators

available in the same negative voltages with the addition of -2 and -5.2 Vdc. The current rating of these regulators with adequate heat sinking is 1.0 A. They employ both current limiting and thermal shutdown circuits built on the chip itself. These circuits can be used with external pass transistors to obtain even higher output currents. Each of the regulator series will accept a maximum input voltage of 35 Vdc except for the 24 V versions which safely accept up to 40 V. The simplicity of the 3-terminal high current regulator permits you to locate regulated power supplies exactly where they are needed avoiding long runs of power leads. The regulator circuit becomes very small and compact compared to the normal discrete parts version. Normally, no external components are required. The 3-pin package shown in the photo is designed for easy mounting to a heat sink to allow the greatest power dissipation rating.

The positive MC7812CP (12 V) can be obtained from your Motorola distributor for $2.20 and the MC7912CP negative (-12 V) for $4.15 in single quantities.

Motorola has introduced a major package innovation to the rf power industry. The MRF227 contains a unique beryllia-insulated die mounting technique used to significantly improve the power dissipation and gain of the standard TO-39 style package. These improvements enable a designer to replace expensive stud mounted, medium power devices, in rf applications, with a low cost alternative. Resultant price savings of 2 to 1 over stud mounted devices are achieved.

This package innovation enables the use of the TO-39 style at medium power levels. By mounting the transistor die on a beryllia insulator, the collector is electrically isolated while still allowing heat to be conducted to the case header. The photo shows an enlarged view of the die and insulator mounted on a TO-39 header as well as a 220 MHz amplifier test circuit.

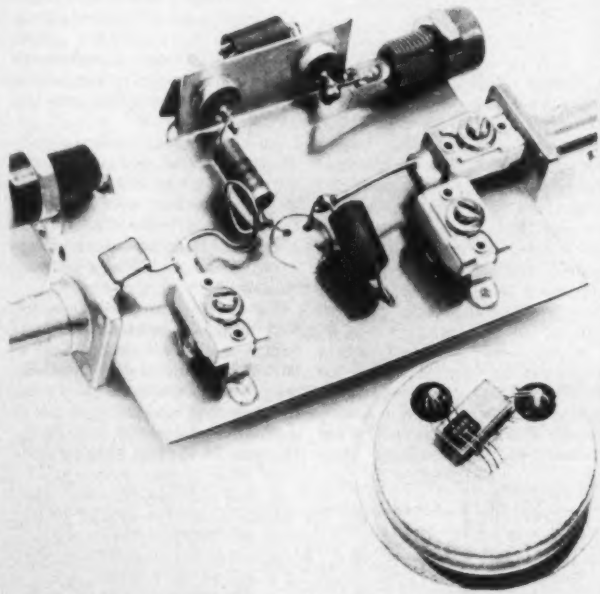
The emitter is connected directly to the case which is soldered to circuit ground; this provides lower emitter inductance and reduced parasitics in the common emitter configuration. In a typical installation, as shown in the photo, the device is mounted directly to a heat sink or the case of the equipment. No more insulating washers and associated mounting hardware!

Compared to stud mounted devices, where the collector is tied to the case for thermal reasons, this new technique can provide improved performance. A typical stud configuration requires bond wires from the transistor die to a substrate solder bridge. The bridge is connected to package leads and these leads are then soldered to the circuit. The beryllia insulated die mounting technique offers a lower cost part.

The MRF227 is the first device available from Motorola using this new mounting method. This device and new packaging technique was originally developed for the proposed class E CB section of 220. We all hope that this great development never finds its way into that type of equipment (and that the FCC leaves 220 as it is), but instead into the final or driver slots of homebrew or commercial 220 portable and mobile FM gear for ham use.

The MRF 227 is conservatively rated at 3 W with a power gain of 13.5 dB minimum and an efficiency of 60%. Two more devices are expected to follow the MRF227. They are the MRF237, a VHF driver, and the MRF629, a UHF driver. More on these as info becomes available.

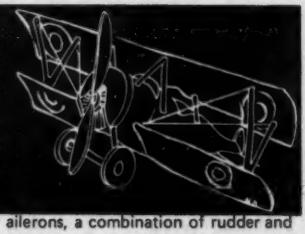
The unit price of the MRF227 is $2.50 (not bad eh, for a VHF power transistor?) and down to $2.00 for those who can find a use for 100 of them! This transistor could really start off an interest in building for a band that needs our attention and participation. Remember — 220, USE IT OR LOSE IT!!!



MRF227, 220 MHz Power Transistor

Autobiography of an Ancient Aviator

W. Sanger Green
1379 E. 15 Street
Brooklyn, NY 11230



One of the more pleasant things about publishing 73 Magazine has been the considerably above average intelligence of the readers – an intelligence which has allowed them to be interested in a wide range of things in addition to our mutual bond of amateur radio. Each excursion into non-ham subjects has brought a volley of thoughtful letters from readers – plus an occasional brickbat, for there are a few hams who don't want to know nothin' about nothin' but ham radio.

Since a high percentage of amateurs are also pilots, it seems obvious that there must be some similarity in the personality defects which draw men into these hobbies. So, starting with this issue we will be running a series on the beginnings of aviation in this country, written by a man who was there when it started – who had commercial flying license number 73 – who knew Lindberg and Amelia Earhart personally – who helped start one of the first transatlantic airlines – and who was one of the early barnstormers. ...Wayne

FIRST ALLUREMENT

The time: Just after sunrise on a bright sunny morning in July 1914.
The place: A newly mown meadow on the Lisbon Road just below Littleton, N.H.
The Event: First test flight of a locally home made aircraft.

John Woods, a Littleton boy, had bought plans, specifications, some materials and a small engine for a single Wright type pusher biplane. During the previous winter and spring he had built the wings, control surfaces and other parts of the machine in his barn, mostly by himself. He had finished final assembly and rigging of the machine and had run up his engine the afternoon before. However, he put off his test flight until the next morning when the early morning air would be more dense and would give his wings more lift.

The machine had a pilot's seat in the center of the lower wing with controls for engine, elevators, rudders and wing warping. Since this aircraft was designed before the invention of ailerons, a combination of rudder and warping of the wings was used for banking and turning flight. As I remember, it had no wheels but used skids instead.

When all was ready John got two of us to stand at each wing tip to hold the machine back while he rev'd up the engine. Then he had another fellow pull the propeller through to start the engine. After a few tries the engine started and appeared to be running satisfactorily. Then, at a wave of John's hand, the four wing men started the machine forward and let go.

The craft gathered speed and, after going about 100 feet, left the ground and had gained about two feet altitude when a small rise in the meadow proved to be an insurmountable object. The craft was travelling at a speed of about forty miles per hour when it hit the knoll. The frail stick and wire construction collapsed and the machine was shattered beyond repair. In those days the wing struts were not bolted in but were held in place by the flying and landing wire rigging.

John Woods' injuries were quite superficial – only a few bumps and scratches. We helped him gather up the pieces and load them on his truck. Later he told me that he had decided not to try to rebuild the machine and that, although he was determined to learn to fly, he was going to wait until a more airworthy and less fragile craft was available.

This is how my interest in aeronautics and desire to fly began.

About fifteen years later I met John at the Philadelphia Naval Air station where we spent several hours talking about what each had been doing since 1914. John was then a test pilot for an aircraft engine company. Only the day before it had been necessary for him to bail out of a plane with an experimental engine he was testing when the engine blew up. I was investigating the accident. Our paths haven't crossed since then.

NEXT EXPOSURE

The first World War came along and I was kept busy as an Infantry 2nd Lieutenant until I was discharged in June 1919. I returned to Littleton with the idea of taking the rest of the summer to demilitarize myself, do a little fishing and prepare for the next phase of my life. Two or three weeks after my return Bob Fogg arrived in Bethlehem in his Curtiss OX-5 Jenny. He was carrying one passenger at a time from a hillside field on Lewis Hill. I was interested enough to pay him $5 each for three ten minute rides. By that time my mind was made up. I wanted to learn to fly as a start in the aviation business that I felt was sure to develop in a few years. If I had known then that it was going to be another ten years or more before aviation would amount to much as a business I might have made a different choice.

Since I was then a 2nd Lieutenant in the Army Infantry Reserve I thought I might be able to get the Army to put me on active duty assigned to the next Air Corps flying school class. However, when I got to Washington in the fall of 1919 I found that I was about the only one to which my plan appealed. So I went over to Bolling Field in Anacostia and asked some of the officers for their advice on how best to go about getting an appointment to the Air Corps Flying School. Their advice was to get as many letters as possible from the New Hampshire Senators and Representatives to the Chief of the Air Corps recommending me for appointment as a Flying Cadet. I finally got letters from both Senators and one Representative and delivered them together with an application to the office of the Chief of the Air Corps. I was told that it would take some time to process the application and that I would be notified of their decision. I then got one of the Senators who knew my father quite well to phone the Chief once in a while to inquire about my application.

Thus matters drifted on for a few months. I was back in Littleton when, in March, I received a letter from the Chief of the Air Corps requesting me to appear before a selection board at Bolling Field in April. This board would determine my fitness for appointment as a Flying Cadet. I appeared as requested, answered all of their questions and asked a few of my own. The decision of the board was to recommend my appointment provided I could pass their physical examination for flying. The next day I took the physical examination and passed

with no waivers. After this the board advised me that, since the 1920 class was full, they would enter my name for the class starting in Sept. 1921. Next month I'll tell you about the air primary and advanced flying schools.

50 MHz BAND

Bill Turner WAØABI
Five Chestnut Court
St. Peters MO 63376

WBØCHL writes that he is a convert to 6 meters and when he says convert, he means convert. Jim has converted an E. F. Johnson solid state SSB CB rig to 6 meters. The power out isn't too great at the moment, about 2 W PEP, but a 60 W solid state amplifier is in the works to make it competitive with the 6146 tube rigs. Jim hasn't had too much success "on the air" as yet but mentions openings from Northfield, MN on November 18th, 21st, 25th and 30th. I am sure everyone has read articles on converting CB rigs to 10 meters and even a few have been converted to 6 but to my knowledge this is the first SSB rig converted. Congratulations Jim.

K8DFR "Mac" writes from Lansing, Michigan to inquire about VHF Communications Magazine. For the benefit of those who don't know, this is the English language translation of the German VHF/UHF magazine UKW Berichte (Ultra Short Wave Report). Published quarterly for a subscription price of $5.75, this magazine is basically construction and features all size PC layouts of all projects or you may obtain parts kit and/or PC boards from the subscription representatives. The rep. for the east is VHF Communications, 915 North Main St., Jamestown, N.Y. 14701. Those in the central and west should contact Bob Eide WØENC, 53 St. Andrew, Rapid City, SD 57701.

While listening to the band trying to open to Fla. the evening of November 25 I heard WA4PXW working several stations. Signals were QSBing rather badly so I started tuning around a little. Up the band I heard a weak signal and stopped to listen, it turned out to be K7PXI from Phoenix. I immediately turned the beams from SE to SW only to find the signal had completely disappeared. After much beam swinging it was determined that Carl was weak but consistant with the beams SE with absolutely no copy to the SW. I listened as contacts were made in Texas, Oklahoma and (as I remember) Louisiana. All during this time WA4PXW could be heard occasionally but never for more than a few seconds at a time.

Forrest K4YPO telephoned just to say hello while on vacation in the area . . . KØKYZ/8 called to ask questions about the SBE SB-50, he is thinking of buying one . . . Yaesu planning to ship the first FT-620B's to dealers the third week in December, they should be available in quantity by now . . . WA4BDW has petitioned the FCC to require all Technician examinations be taken before the FCC or designated authority, a good idea I think . . . it would remove some of the stigma and at the same time make it simpler to study for the General. Did you see the excellent 50 MHz propagation article in Ham Radio's December issue or the 6 meter conversion for the SB-220 in December's QST?

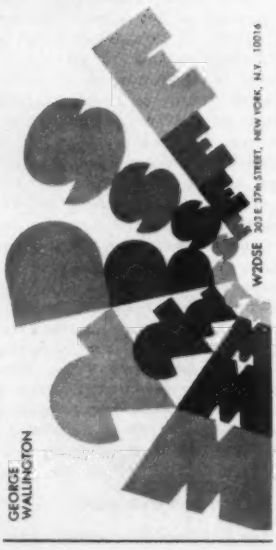
From Dallas WA5IKU mentions a number of openings: "Good to better on 11-17 – WB4LDO/4, WA9RDF, K8RZB, and many others . . . all good strong signals." Unusual opening 11-25, "worked WA4IMG and WB4YSE . . . band very noisy . . . tuned down around 50.085 . . . beam south . . . Spanish QSO on AM . . . very strong for a few minutes." By later postcard Perry mentions another opening 11-30 "band really opened up today. Heard Ø, 1, 4, 6, 20 to 30 over 9. Very good contact with WB5CNZ – Marty – New Mexico . . . great signal." Perry would like to hear from other hams who are postal employees; write him at 2240 Prichard Lane, Dallas, TX 75227.

Joe WB4OSN says the band has been rather dead in Florida but we did talk twice during the month and other later reports indicate an upturn late in the month.

By the time this appears in print 1975 will be well under way and it will be time to begin any projects which are to be completed before the spring DX season. If your rig needs to be overhauled, do it now. If you want that linear finished, you had better get underway. It isn't too early to start planning the antenna and tower modifications either. Plans here include a cathode driven single 4CX250B in a case to match the SB-50 and pulling down the time ravaged pair of 6 element Telrexs and installation of a single 8 element KLM along with raising the tower an additional 10 feet (3.6M).

...WAØABI

QSL CONTEST



There is no way to do justice to this month's winner on a black and white page. The colors are brilliant. Those that abut look gorgeous together and all the colors are balanced well, with careful consideration given not only to the letters which touch each other but the overall effect of the design, that the result is a terrific piece of op art. George wins the free one year subscription this month. Send in your entry to 73, QSL Contest, Peterborough, NH 03458.

Photo taken by WA4WBR in Betheny Beack, Delaware.

FCC NEWS

DOCKET 19555 ORDER

Environmental docket released

While amateur radio is mentioned in this report and order only once – having to do with amateur earth stations for satellite use – the final rules would seem to have little impact on amateurs. DXers who want to put up towers over 300 feet high should start trying to decypher the fine print and make sure that they do not disturb Uncle. Repeater groups who intend to erect towers over 100 feet high for microwave relay are also advised to see if they can find someone to interpret the extensive order. Other than that, the rules changes would seem to have no relevance to amateurs. Somewhere along the line that bit about getting permission from neighbors before erecting ham towers got sidetracked –hallelujah! It's a good thing amateurs made an uproar over this . . . chalk up another win as proof that it really does pay to become involved in "fighting city hall."

FCC 74-1336
25225

Before the Federal Communications Commission, Washington, D.C. 20554
In the Matter of
Amendment of Part 97 of the Commission's Rules concerning operator classes, privileges and requirements in the Amateur Radio Service.

Docket No. 20282

RM-1016,	RM-1363,	RM-1454
RM-1456,	RM-1516,	RM-1521
RM-1526,	RM-1535,	RM-1568
RM-1572,	RM-1602,	RM-1615
RM-1629,	RM-1633,	RM-1656
RM-1724,	RM-1793,	RM-1805
RM-1841,	RM-1920,	RM-1947
RM-1976,	RM-1991,	RM-2030
RM-2043,	RM-2053,	RM-2149
RM-2150,	RM-2162,	RM-2166
RM-2216,	RM-2219,	RM-2256
RM-2284,	RM-2449	

NOTICE OF PROPOSED RULE MAKING

Adopted: December 4, 1974;
Released: December 16, 1974
By the Commission: Commissioner Quello absent.

1. The Commission has before it the above listed petitions (also listed in more detail in Appendix I) for rulemaking. Principally, petitioners are seeking amendment to the Rules for the Amateur Radio Service regarding operator classes, requirements, and privileges. Some desire additional privileges for only one specific operator license class, or desire lower requirements for one specific class. Others want more extensive amendments, such as the deletion, or addition, of an entire license class. Some would establish a new "Hobby" operator license class, having no telegraphy skill requirement. Of these, RM-1841, RM-1991, and RM-2053 would have this operator class in the Citizens Radio Service. Since operation of a radio station as a hobby or diversion, i.e., an activity in and of itself 1/, is prohibited in the Citizens Radio Service, we consider such operation to be one more suitable to the Amateur Radio Service. Thus, these three petitions are included in this proceeding. RM-1633, RM-1656, RM-1793, and RM-1841 are also included in Docket 19759, but will be considered herein to the extent applicable. Additionally, petitions RM-1947 and RM-2256 contain proposals otherwise pertaining to operator privileges and are included herein for that reason.

2. RM-1629 relates to the possibility for conducting operator examinations at places other than regular Commission examination points by persons other than Commission employees. Since the entire matter of amateur radio operator examinations will be under consideration in this proceeding, it is also incorporated.

3. The type of amendments requested by the petitioners cover a broad scope of thoughts and ideas. In summary, the salient requests are:

a. Authorize some, or all, Novice Class privileges to the Technician Class.

b. Permit a person to hold both a Novice Class license and a Technician Class license.

c. Authorize some privileges in the 144-148 MHz frequency band to the Novice Class.

d. Authorize all of the 144-148 MHz frequency band to the Technician Class.

e. Authorize some privileges in the 28-29.7 MHz frequency band to the Technician Class.

f. Reallocate the frequency subbands among the various license classes.

g. Establish new frequency subbands for incentive purposes in the 1800-2000 kHz band.

h. Authorize Amateur Extra Class operator privileges to Advanced Class operators.

i. Limit transmitter power privileges for General Class operators to 250 watts on the 3.5 MHz, 7.0 MHz and 14.0 MHz frequency bands.

j. Limit transmitter power privileges for all operator classes to 300 watts on amateur frequency bands below 30 MHz.

k. Specify maximum transmitter power in terms of output.

l. Establish a new Hobby Class license, or a new VHF Telephony Class license having no telegraphy requirements or privileges.

m. Establish a new Beginner Class and a new Code Class of operator licenses.

n. Combine the Novice Class license and the Technician Class license into a new VHF Telephony Class.

o. Establish a new Intermediate Class license and a new Communicator Class license.

p. Establish a new Advanced Technician or First Class Technician Class license.

q. Discontinue the Conditional Class and Technician Class operator license.

r. Issue the Amateur Extra Class operator license for life.

s. Reduce Element 1(B) telegraphy requirement from 13 words per minute to 10 words per minute.

Obviously, we cannot accommodate all of these requests because some are in conflict with others. We do not believe it is desirable to deal with these petitions on a piecemeal basis, since many are interrelated. Accordingly, we conclude the time is propitious for a review of our entire amateur licensing structure. To this end, we have reviewed the petitions carefully, together with the existing system of operator privileges and requirements, against the fundamental basis and purpose of the Amateur Radio Service. The following represents our best forecast of the direction we should move in this matter.

4. We recognize the desire by some amateurs, and would be amateurs, as expressed in RM-1633, RM-1793, and RM-1976, for a class of amateur oper-

1/ See §95.83(a)(1).

ator license having requirements that do not include a knowledge of telegraphy. Although every amateur radio operator license has traditionally required the applicant to demonstrate some level of proficiency in International Morse Code, goals within the basis and purpose of the Service could be met, at least in part, without this requirement. Moreover, as several of the petitioners point out, the International Radio Regulations do allow the Commission to waive the requirement for an amateur to "... have proved that he is able to send correctly by hand and to receive correctly by ear, texts in Morse code signals..." 2/ in the case of stations only operated above 144 MHz. A survey and analysis 3/ conducted in 1971 indicated that there may be as many non-licensees interested in amateur radio activities, if not more, than there are persons already licensed in the Amateur Radio Service. The most often mentioned reason for not obtaining an amateur license is the telegraphy requirements. We are aware the need for, and the use of, telegraphy in amateur radio communications is much less on amateur frequency bands above 50 MHz than it is on the amateur frequency bands in the High Frequency (3-30 MHz) and Medium Frequency (.3-3 MHz) range, where spectrum conservation, tolerance to interference, and other factors, make telegraphy an important mode of amateur radio-communication. We believe, under carefully established provisions, a new "telephony-only" type of operator license, limited to frequencies above 144 MHz, could and should be incorporated into the Amateur Radio Service.

5. The present operator license structure is shown in Figure 1. For all intents and purposes there are ten classes of operator licenses available in five ascending levels of operator privileges. Qualification for an operator license is established by means of the various examination elements shown in Figure 1. These may be administered either by a Commission examiner or by a volunteer examiner through the mail examination system. The Amateur Extra (C) Class, the Advanced (C) Class, and the Conditional (P) Class licenses are issued to physically disabled applicants qualifying on the basis of a mail examination administered by a volunteer. The Conditional Class license is issued to applicants qualifying on the basis of a mail examination administered by a volunteer, because of distance or other unusual difficulty in appearing at a regular examination point. The Technician (C) Class and Novice Class licenses are issued to applicants qualifying on the basis of a mail examination administered by a volunteer, the normal procedure for these license classes. Except for the Novice Class license and the Conditional Class license, the absence of the designator (C) or (P) following the operator class on the license means the licensee has qualified before a Commission examiner, and is not subject to re-examination. Any licensee qualifying on the basis of mail examination may be required by the Commission to appear before a Commission designated examiner for re-examination. Periodically, a sample number of licensees who have obtained their licenses on the basis of a mail examination are selected at random and asked to appear in order to verify the validity of the mail examination system. Those who do not appear. and those who do not pass the re-examination, are subject to license cancellation.

6. The privileges associated with each operator license class are intended to provide the necessary incentives for amateurs to upgrade their skills. This system has been largely responsible for thousands of amateurs to upgrade, particularly to Advanced Class and to Amateur Extra Class. The current number of operators in each license class is shown in Figure 2. While it is gratifying to see even the limited success of this system toward fulfilling the basis and purpose of the Amateur Radio Service, it is a desirable goal for most amateurs to reach a higher operator class, say the Advanced Class, or even the Amateur Extra Class. 4/

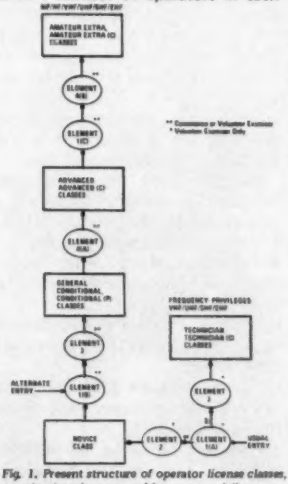


Fig. 1. Present structure of operator license classes, examination elements and frequency privileges.

7. An inherent principle in arriving at any new licensing system is a logical relationship between the qualification requirements and the operator privileges authorized at each license class level. For instance, it would not be rational to require an applicant to demonstrate a certain specific proficiency in order to qualify for a particular operator license class which authorized no corresponding privileges requiring that proficiency. Conversely, an operator license class should not authorize significantly more privileges than the requirements for that license class reasonably justify. While we believe there are the means available within the Amateur Service to satisfy the reasonable needs of most United States citizens having a genuine interest in pursuing radio activities within the basis and purpose of the Service, there are basic limitations brought about by practical realities. For example, the vast array of interests and levels of ability among amateurs must be provided for within a fixed number of different operator license classes. The resources available to the Commission for regulating the Service are not unlimited. Issuing licenses, preparing and conducting examinations, monitoring the frequencies, enforcing the regulations, etc., are all activities that must be provided by the Commission. In this proceeding, we are moving on the assumption the amateurs' record of cooperation and assistance will continue in the future, and an unduly large increase in the Commission's workload will not be necessary.

8. We are proposing in this pro-

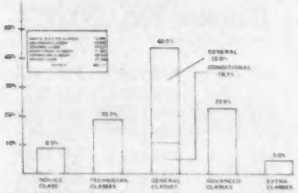


Fig. 2. Percentage of amateur licensees in each class, May, 1974.

2/ Radio Regulation Annexed to the International Telecommunication Convention (Geneva, 1959) Article 41, Section 3(1).

3/ A Survey and Analysis of the Citizens Radio Service. P.B. — 204 595.

4/ §97.1(c) states as one of the principles expressing a fundamental purpose of the Amateur Radio Service: "Encouragement and improvement of the Amateur Radio Service through the rules which provide for advancing skills in both the communication and technical phases of the art."

ceeding to establish a new *Communicator Class* operator license, having no telegraphy requirements nor privileges. Operation under this license would be limited in a manner similar to that of the current Novice Class, except frequency privileges would be above 144 MHz. The objective would be to enable beginners to enter the Amateur Radio Service and, through the experience gained by operation of low-power radiotelephony station, develop the necessary interest and skill to qualify for higher class operator licenses.

9. Those petitions calling for another new operator license class above the current Technician Class raise significant questions regarding the scope of the Technician Class as presently constituted. For example, in RM-1535, the American Radio Relay League (ARRL) states:

> "It is readily apparent from the various pronouncements of the Commission over the years and from the present interests and operations of Technician Class licenses that the purposes for which the Technician Class was established . . . require review. It is respectfully suggested that any Notice of Proposed Rule Making invite comments and suggestions for major revisions of the Technician Class license . . . In numerous disasters . . . including the Alaskan earthquake in 1964 and the recent Hurricane Camille, the contributions of Technicians in providing internal communications have been valuable beyond estimation. Participation by Technicians in the League's Amateur Radio Emergency Corps (AREC) has grown over the years. The evolution of Technicians as communicators as well as experimenters . . . since the class was established must be recognized."

Although interest in the communication aspects of amateur radio has emerged among the some 49,000 Technician Class licensees, apparently they are not sufficiently persuaded by the additional communication privileges in the High Frequency (HF) and Medium Frequency (MF) amateur bands afforded to General Class licensees to the extent of increasing their telegraphy skill from 5 words to 13 words per minute, the only real difference in qualification between the two license classes. The needs and interests of this group probably are fully satisfied by the operation of an amateur radio station in the VHF (Very-high Frequency) regions and above. Accordingly, we can conclude technological and operational developments by amateurs in the VHF, and possibly in the UHF (Ultra-high Frequency) bands, have reached the point where the interest to amateurs is comparable to, if not already exceeding, that in the MF and HF "shortwave" bands. Therefore, in order to provide meaningful incentives for amateurs interested in this part of the radio spectrum to upgrade their skills, the incentive principles should also be applied for these bands similar to those now in effect in the shortwave bands. A new higher class operator license comparable in requirements and privileges to the Advanced Class, except based upon operation above 29 MHz, may be desirable. Obviously, for this new higher class license, any additional telegraphy skill is not meaningful since telegraphy is not a major communication mode in these frequency bands. However, other modes, such as television, remote control, facsimile, repeaters etc., are very meaningful, and need to be emphasized. Therefore, we are proposing another new operator class license, the *Experimenter Class*, as the means toward fulfilling these needs.

10. We have examined several possible revised operator license class structures in a search for the best way to incorporate the proposed Communicator Class and the proposed Experimenter Class licenses. As broad objectives, we desire to 1) preclude, or at least minimize, any adverse impact upon presently licensed amateurs, 2) closely relate requirements to privileges for each license class, 3) provide realistic upgrading steps and incentives, 4) provide the opportunity and flexibility for persons interested only in shortwave radio, or only in VHF and above, or interested in both, to obtain a license and pursue their particular interests. As a result, the structure we are proposing is shown in Figure 3, and the specific proposed rule amendments are given in Appendix II. In general, we favor this structure because it seems to more fully reflect our objectives and to satisfy most of the objectives of petitioners. Two series of operator license would be offered, Series A and Series B. Amateurs would be permitted to hold *one* operator license permitting privileges in one or both series. For example, an amateur could hold an operator license authorizing Novice Class privileges in Series A and also Technician Class privileges in Series B, a request asked for by several petitioners. Operator licenses in Series A would authorize only privileges on amateur frequencies below 29 MHz, and operator licenses in Series B would authorize only privileges on amateur frequencies above 29 MHz. Operator licenses would normally be issued for a 5 year renewable term, including the Communicator Class and the Novice Class in order to compensate for any increased administrative burdens resulting from the proposed amendments. (Novice Class licenses are currently issued on a 2 year, non-renewable basis, no filing fee). Section 303(L)(1) of the Communications Act of 1934 does allow us to issue operator licenses for life, as requested for the Amateur Extra Class in RM-2030. Under our current rules, the operator license 5/ is always combined with the Primary station license which cannot be granted for a term longer than 5 years, a requirement of Section 307(d) of the Act. We are proposing to adept the request. Our records indicate very few amateurs drop out of amateur radio after they have attained the Amateur Extra Class. The licensee would still be required to renew his station license(s) every five years, so in effect, this proposed rule would amount to eliminating the need to retake the examinations should the amateur neglect to renew his license.

11. Under the proposed license class structure, new Advanced Class licenses and General Class licenses

5/ Although large certificates are awarded to Amateur Extra Class licensees upon request, the certificates do not satisfy the availability requirements of §97.83.

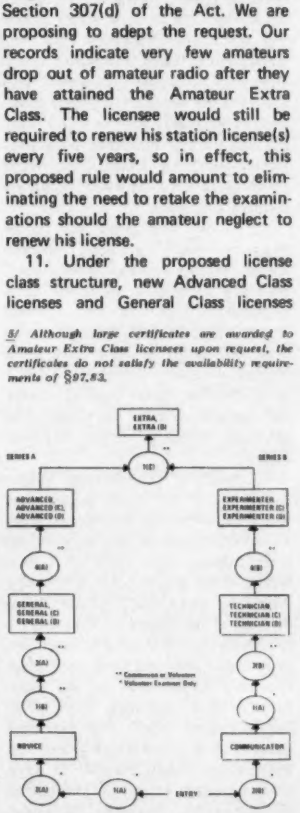


Fig. 3. Proposed revised structure of operator license classes and examination elements.

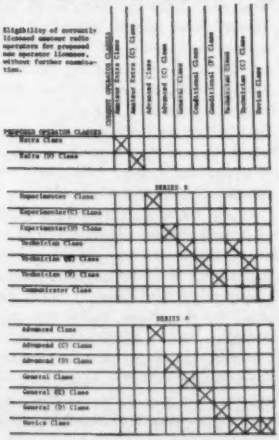
would no longer carry requirements and privileges above 29 MHz. The Experimenter Class and the Technician Class would be the counterpart operator licenses in Series B, and would not carry any requirements and privileges in Series A frequency bands. The Current Amateur Extra Class would be shortened in name to Extra Class, and would authorize full amateur privileges in both series. We are proposing to discontinue the written examination and the exclusive telephony segments available only to this class. The material in the current Element 4(B) examination required for Amateur Extra Class would be combined with the material for the current Advanced Class Element 4(A) and, together with other new material, be used in new examination Elements 4(A) and 4(B) for the Advanced Class and Experimenter Class respectively. Material related to the shortwave domain would be used in 4(A) and material related to the other domains would be used in 4(B). After obtaining both the Advanced Class and Experimenter Class, an amateur would then only need pass the Element 1(C) 20 word per minute telegraphy examination to qualify for the Extra Class. Because of this additional telegraphy requirement, the Extra Class would continue to have exclusive telegraphy subband privileges.

12. Under the proposed license structure, every currently licensed amateur radio operator would automatically be eligible to renew upon application, his current operator license to include privileges in at least one, and in most cases both series without further examination. Table 1 illustrates the highest class, or classes, of operator license that could be obtained without further examination.

13. Both of the proposed license series would be based upon three levels of difficulty: a beginner level, an intermediate level, and an advanced level. Ideally, this type of system would offer a newcomer the opportunity to enter the Amateur Radio Service at the beginner level with a minimum of proficiency, gain the experience and practical knowledge necessary to qualify for the intermediate level, and then move on to the advanced level. The privileges authorized at both the beginner and intermediate levels would be only those necessary to provide the desired experience for upgrading. Similarly, the related qualification requirements would be only the minimum necessary to insure that the licensee understands the privileges, limitations, and responsibilities associated with the license, with particular emphasis on methods for properly evaluating emissions of the type(s) authorized by the license.

14. We are proposing three principle areas of operator privileges: operating frequencies, emissions, and maximum transmitter power. For Series A, the authorized frequency bands would be basically the same as at the present below 29 MHz, except the exclusive telephony segments reserved to the Amateur Extra Class would be also available to the Advanced Class. In Series B, the Technician Class would be authorized all amateur frequencies above 50 MHz, thus gaining additional frequencies 50.0-50.1 MHz and 144-145 MHz. The Experimenter Class would be authorized all above 29 MHz, and the Communicator Class all above 144 MHz. The Extra Class and Experimenter Class would be authorized all amateur emissions. The Advanced Class would be authorized all amateur emissions permitted below 29 MHz. The General and Technician Classes would be authorized emissions A1, A3, and F3. The Novice Class would continue with A1 only, while the new Communicator Class would be permitted emission F3. Related examination elements would contain questions concerning the technical and operational aspects of the emissions authorized.

15. In proposing maximum transmitter power levels, we have taken into consideration a number of factors. Amateur transmitters have not been a significant source of interference to other services, and where there has been a problem, amateurs have been very cooperative. Also, amateurs, by and large, do use the minimum transmitter power necessary to conduct their communications. Therefore, there should be no real problem if the limits were to be increased in some instances. We would like to improve the technique specified in the Rules for determining power. Modern communications requires better methods for determining transmitter power than the "plate voltage times current" method. We are proposing to specify the maximum transmitter output in terms of peak envelope power (PEP), except at the beginner level where the emissions authorized do permit a fairly accurate measurement to be made of the input power using the method now specified. Under current rules and practices, the maximum output peak envelope power that could be developed would be on the order of 2000 watts (100% modulated, full carrier, double sideband A3). Specifying this level as advanced amateur practice, and 6 dB (approximately one "S" unit) as intermediate amateur practice (500 watts PEP output) is the method used to establish these proposals. An additional 6 dB lower step (250 watts input approximates 125 watts output PEP for A1 and F3 emissions) would be the beginner level. 6/



16. The requirements for a new license, as shown in Appendix II, are similar to those now in effect, except the content of the various examination elements would be adjusted to more closely correlate with the privileges for each particular license class. While we are not proposing to lower, or increase, the telegraphy speed requirements, we are proposing a modification in the manner of testing. In RM-1724, the petitioner claims most operators must pass through a "code hump" between the speeds of 11 and 13 words per minute. Possibly the 5 wpm rate and the 10 wpm rate require the same skill level. In any event, the 13 wpm rate does require a skill level above that required for a 5 wpm rate. Otherwise, there would be no point to have both a Technician Class and a General Class under the present rules, since the two skill levels are the only difference between the requirements. Therefore, we are not proposing any changes in the telegraphy examination speeds.

17. Under the proposed system, the operator license for an amateur

6/ See 11, Appendix II, p. 24.

qualifying by means of a mail examination on the basis of a protracted physical disability would have the letter (D) inserted following the operator class [example: Advanced (D) class]. A license of this type would be renewable without re-examination upon satisfactory showing the disability continued, and they could not appear for a regular Commission supervised examination. Otherwise, they would be required to demonstrate their proficiency through re-examination. The operator license of an amateur qualifying by means of a mail examination on the basis of difficulty in traveling to a regular Commission examination point, would have the letter (C) inserted following the operator class (example: General (C) class). The only purpose of this conditionally issued type of license would be to provide a temporary authorization until the person could qualify before a Commission examiner. Hence, these licenses would not be renewable, since it would not be unreasonable to expect a conditionally licensed amateur to travel to one of the many Commission examining points sometime within the five year period. He would then have to successfully complete a regular Commission supervised examination in order to continue as an amateur radio operator.

18. In the best interests of the Amateur Radio Service, and to be fair to all amateurs, we believe that every applicant should clearly establish his qualifications for the privileges authorized by an amateur radio operator license. Overall, our experience indicates mail examinations are not as effective as Commission supervised examinations in establishing qualifications. Because of our experience in re-examining amateur radio operators, and considering the proposed amendments may place additional demands upon a mail examination system, we are proposing some amendments in Appendix 2 intended to improve the system. Only an Extra Class licensee would be eligible to serve as a volunteer examiner for all examination elements. Advanced Class licensees would be eligible to administer examination elements for the General (C) and (D), and Novice Classes. Experimenter Class licensees would be eligible to administer examination elements for the Technician (C) and (D), and the Communicator Classes. Another proposal is to increase the required number of persons administering a volunteer examination. The second person may be the holder of any class of amateur operator license.

19. A specific call sign proposal is not included in this proceeding. However, because of the ramifications of this proposal, some relative comments are appropriate. *Existing licensees* will be able to retain current call signs if desired, and if authorized for both privileges, the same call sign may be used in both Series A and B. Licensees in Series B entering amateur radio as a result of this proceeding, will be issued a distinctive call sign for operation in that Series. If a later authorization for Series A privileges is granted, the single resulting call sign will reflect the dual Series authorization. Under this proposal, Technician Class licensees could obtain Novice privileges in Series A without examination, and therefore could retain their present call signs if desired. Further details will be contained in the call sign proceeding to be issued.

20. In view of the extensive amendments to the rules requested by the petitioners, and those proposed herein, it is imperative those submitting comments carefully consider the future needs of the Amateur Radio Service. To this end, we are allowing more than the normal amount of time for suggestions and comments to be filed. These proposals represent our best thoughts in these important matters. We are interested in receiving comments from informed amateurs in these areas.

21. Authority for the proposed rule changes herein is contained in §§ 4(i) and 303 of the Communications Act of 1934, as amended.

22. Pursuant to applicable procedures set forth in § 1.415 of the Commission's Rules, interested persons may file comments on or before **June 16, 1975, and reply comments on or before July 16, 1975.** All relevant and timely comments and reply comments will be considered by the Commission before final action is taken in this proceeding. In reaching its decision on the rules which are proposed herein, the Commission may also take into account other relevant information before it, in addition to the specific comments invited by this Notice.

23. In accordance with the provision of § 1.419 of the Commission's Rules and Regulations, an original and 14 copies of all comments, pleadings, briefs, or other documents shall be furnished the Commission.

24. All filings in this proceeding will be available for examination by interested parties during regular business hours in the Commission's public reference room at its headquarters in Washington, D.C., (1919 M Street, N.W.).

FEDERAL COMMUNICATIONS COMMISSION
Vincent J. Mullins
Secretary

APPENDIX I
Petitioners

1. RM-1016 D. McGarrett, Centereach, New York
2. RM-1363 K. J. Deskur, Endwell, New York
3. RM-1454 S. C. Davis, Manchester, Connecticut
4. RM-1456 W. Green, Peterborough, New Hampshire
5. RM-1516 E. W. DeCloedt, Cupertino, California
6. RM-1521 W. A. Welch, II, Wappong, Connecticut
7. RM-1526 E. C. Lips, Pittsburgh, Pennsylvania
8. RM-1535 American Radio Relay League, Newington, Connecticut
9. RM-1568 E. E. Gooch, Brilliant, Ohio
10. RM-1572 C. DeWitt, Omaha, Nebraska
11. RM-1602 C. R. Clark, Notre Dame, Indiana
12. RM-1615 C. C. Drumeller, Warr Acres, Oklahoma
13. RM-1629 M. K. Gormley, APO, New York, New York
14. RM-1633 W. Green, Peterborough, New Hampshire
15. RM-1656 Ronald A. Reed, West Los Angeles, California
16. RM-1724 R. A. Cowan, Port Washington, New York
17. RM-1793 G. Jacobs, Silver Springs, Maryland, S.F. Meyer, Linden, New Jersey
18. RM-1805 Radiotrician Confederation, Grouse Creek, Utah
19. RM-1841 United CBers of America, Detroit, Michigan
20. RM-1920 C. W. Tazewll, Baltimore, Maryland
21. RM-1947 R. R. Dopmeyer, Opelousa, Louisiana
22. RM-1976 Edgewood Amateur Radio Society, Baldwin Park, California
23. RM-1991 U.S. Citizens Radio Council
24. RM-2030 L. E. White, Closter, New Jersey
25. RM-2043 R. E. Heimberger, Shaker Heights, Ohio
26. RM-2053 Hercules Radio and Recording Studio, Daytona Beach Florida

27. RM-2149 M. R. Wardean, Venice, California

28. RM-2150 W. A. Schroeder, Cherry Hill, New Jersey

29. RM-2162 Falmouth Amateur Radio Association, Woods Hole, Massachusetts

30. RM-2166 W. Brady, Norwalk, California

31. RM-2216 H. M. Krawetz, Sunnyvale, California

32. RM-2219 J. C. Hallford, Ft. Stockton, Texas

33. RM-2256 M. S. Donnell, San Jose, California

34. RM-2284 S. E. Green, et al, Austin, Texas

35. RM-2449 P. Williams, Santa Cruz, California

APPENDIX II

Part 97, of Chapter I of Title 47 of the Code of Federal Regulations is amended as follows:

1. §97.5 is amended to read:

§97.5 Classes of operator licenses.

(a) The following Series A operator licenses authorize operations in the amateur radio frequency bands below 29 MHz:

(1) Advanced Class, Advanced (C) Class, Advanced (D) Class. Licenses to conduct amateur radio communications using advanced level amateur practices.

(2) General Class, General (C) Class, General (D) Class. Intermediate grade licenses to conduct amateur radio communication for the purpose of developing individual proficiency toward qualifying for the Advanced Class license.

(3) Novice Class. Introductory grade license to conduct amateur radio operation for the purpose of developing proficiency toward qualifying for the General Class license.

(b) The following Series B operator licenses authorize operations in the amateur radio frequency bands above 29 MHz:

(1) Experimenter Class, Experimenter (C) Class, Experimenter (D) Class. Licenses to conduct amateur radio communication using advanced level practices.

(2) Technician Class, Technician (C) Class, Technician (D) Class. Intermediate grade licenses to conduct amateur radio communication for the purpose of developing individual proficiency toward qualifying for the Experimenter Class license.

(3) Communicator Class. Introductory grade license to conduct amateur radio communication for the purpose of developing individual proficiency toward qualifying for the Technician Class and Novice Class licenses.

(c) The Extra Class and Extra (D) Class licenses authorize amateur radio operation using all authorized privileges, including certain exclusive privileges.

(d) The designator (C) following the type of operator license class indicates the license is conditionally issued because the licensee qualified under the provisions of §97.28.

(e) The designator (D) following the type of operator license class indicates the license is conditionally issued because the licensee qualified under the provisions of §97.27.

2. §97.7 is amended to read as follows:

§97.7 Privileges of operator license.

The following operating privileges are authorized by the class of operator license indicated for all new amateur licenses issued after (effective date of new rules). Amateurs licensed prior to the date will receive a new license upon the first renewal after (effective date of new rules).

(a) Extra Classes. All amateur radio operator privileges.

(b) Advanced Classes. All amateur radio operator privileges below 29 MHz, except for frequencies 3500-3525 kHz, 7000-7025 kHz 14000-14025 kHz, and 21.000-21.025 MHz.

(c) General Classes.

(1) Frequencies 1800-2000 kHz, 3525-3775 kHz, 3890-4000 kHz, 7.025-7.150 MHz, 7.225-7.300 MHz, 14,025-14.200 kHz, 14.275-14.350 kHz, 21.025-21.250 MHz, 21.350. -21.450 MHz and 28.0-29.0 MHz within the limitations of §97.61.

(2) Emissions A1, A3, and F3.

(3) Except for power limitations set forth in §97.61, the maximum transmitter output power shall not exceed 500 watts peak envelope power.

(d) Novice Class.

(1) Frequencies 3700-3750 kHz, 7100-7150 kHz, (7050-7075 kHz when the amateur radio operation is not within Region 2), 21.100-21.200 MHz, and 28.100-28.200 MHz.

(2) Emission A1.

(3) 250 watts input power to the transmitter final amplifying stage supplying radio frequency energy to the antenna, exclusive of power for heating the cathode of a vacuum tube(s), within the limitations of §97.67.

(e) Experimenter Classes. All amateur radio operator privileges above 29 MHz.

(f) Technician Classes.

(1) All amateur frequencies above 50 MHz.

(2) Emissions A1, A3, and F3.

(3) Except for power limitations set forth in §97.61, the maximum transmitter output power shall not exceed 500 watts peak envelope power.

(g) Communicator Class.

(1) All amateur frequencies above 144 MHz.

(2) Emission F3.

(3) 250 watts input power to the transmitter final amplifying stage supplying radio frequency energy to the antenna, exclusive of power for heating the cathode of a vacuum tube(s), within the limitations of §97.67.

3. §97.9 is revised to read as follows:

§97.9 Eligibility for a new operator license.

Any citizen 1/ or national of the United States is eligible to apply for an amateur radio operator license. A person may be issued no more than one operator license in Series A, and no more than one in Series B. A holder of an Extra Class operator license may not hold any other amateur radio operator license issued by the Commission. The requirements for each operator class are:

(a) Extra Class: Applicant shall have successfully completed examination elements 1(C), 2(A), 2(B), 3(A), 3(B), 4(A), and 4(B).

(b) Advanced Class: Applicant shall have successfully completed examination elements 1(B), 2(A), 3(A), and 4(A).

(c) General Class: Applicant shall have successfully completed examination elements 1(B), 2(A), and 3(A).

(d) Novice Class: Applicant shall have successfully completed examination elements 1(A) and 2(A).

(e) Experimenter Class: Applicant shall have successfully completed examination elements 1(A), 2(B), 3(B), and 4(B).

(f) Technician Class: Applicant shall have successfully completed examination elements 1(A), 2(B), and 3(B).

(g) Communicator Class: Applicant shall have successfully completed examination element 2(B).

4. Section 97.13 and headnote are revised to read as follows:

§97.13 Eligibility for renewal of operator license.

(a) An amateur radio operator license, other than a conditionally issued license, may be renewed upon proper application, in which it is

1/ Senate Bill 2457 if enacted; would delete citizenship requirement.

stated that the applicant is fully qualified in the requirements for the original license of the class being renewed. If the applicant is not fully qualified, the license will not be renewed, and the applicant may apply for a new operator license if and when he qualifies by examination at a later date.

(b) If a license, other than a conditionally issued license, is allowed to expire, application for renewal may be made during a period of grace of 1 year after the expiration date. During this 1 year period of grace, an expired license is not valid. A license renewed during the grace period will be dated currently and will not be backdated to the date of its expiration.

(c) Application for renewal of an amateur radio operator license shall be submitted on FCC Form 610 and shall be accompanied by the applicant's operator license or photocopy thereof. Application for renewal of unexpired licenses must be made during the license term. In any case in which the licensee has, in accordance with the provisions of this section, made timely and sufficient application for renewal of an unexpired license, no license with reference to any activity of a continuing nature shall expire until such application shall have been finally determined.

(d) Operator licenses obtained on the basis of § 97.28 are not renewable.

(e) Operator licenses obtained on the basis of § 97.27 are not renewable unless the application is accompanied by a current physician's affidavit.

(f) Extra Class operator licenses are issued for the life of the licensee, and do not have to be renewed.

5. Section 97.15 is added new to read as follows:

§ 97.[illegible]odification of operator license.

(a) Application for modification of an amateur radio operator license shall be submitted on FCC Form 610 and shall be accompanied by the applicant's operator license(s) or photocopy(s) thereof.

(b) When only the name of the licensee is changed, or when only the mailing address is changed, a formal application for modification of license is not required. However, the licensee shall notify the Commission promptly of these changes. The notice, which may be in letter form, shall contain the name and address of the licensee as they appear in the Commission's records, the new name and/or address, as the case may be, the primary station call sign and class of operator license. The notice shall be sent to Federal Communications Commission, Gettysburg, Pennsylvania 17325, and a copy shall be kept by the licensee until a new license is issued.

6. Section 97.21 is revised to read as follows:

§ 97.21 Examination elements.

Examination for amateur radio operator privileges will comprise one or more of the following elements:

(a) Element 1(A): Slow speed telegraphy test in International Morse code at 5 words per minute.

(b) Element 1(B): Intermediate speed telegraphy test in International Morse code at 13 words per minute.

(c) Element 1(C): High speed telegraphy test in International Morse code at 20 words per minute.

(d) Element 2(A): Rules, basic principles, and amateur practices essential to beginners' amateur radiotelegraphy operation using the privileges authorized to the Novice Class.

(e) Element 2(B): Rules, basic principles, and amateur practices essential to beginners' amateur radiotelephony operation using the privileges authorized to the Communicator Class.

(f) Element 3(A): Rules, intermediate level principles, and amateur practices essential to amateur radio operation using the privileges authorized to the General Class.

(g) Element 3(B): Rules, intermediate level principles, and amateur practices essential to amateur radio operation using the privileges authorized to the Technician Classes.

(h) Element 4(A): Advanced level principles and amateur practices essential to amateur radio operation using the privileges authorized to the Advanced Class.

(i) Element 4(B): Advanced level principles and amateur practices essential to amateur radio operation using the privileges authorized to the Experimenter Class.

7. Section 97.23 is revised to read as follows:

97.23 Examination requirements.

(a) The telegraphy test required of an applicant for an amateur radio operator license shall determine the applicant's ability to send correctly by hand using a hand key (or, if supplied by the applicant, a semi-automatic or electronic, hand operated key, other than keyboard type) and to receive correctly by ear, in plain language, messages in the International Morse code at not less than the prescribed speed, counting 5 characters to the word, each numeral or each punctuation mark counting as 2 characters.

(b) All written examinations for an amateur radio operator license shall be completed by the applicant in legible handwriting or hand printing by means of ink or pencil. Whenever the applicant's signature is required, his normal signature shall be used. Applicants unable to comply with these requirements, because of a physical disability, may dictate their answers to the examination questions and to the receiving code test. If the examination, or any part thereof, is dictated by the applicant, the examiner shall certify the nature of the applicant's disability and the name and address of the person(s) taking and transcribing the dictation.

8. Section 97.25 is revised to read as follows:

§ 97.25 Examination credit.

(a) An applicant for an amateur radio operator license will be given credit for those examination elements required for any other class or operator license held when the application is filed. However, credit will not be given for examination elements 1(B), 3(A), 3(B), 4(A), and 4(B) given under the provisions of § 97.30 for a class of operator license other than that being applied for, except for holders of Advanced (D) Class, Experimenter (D) Class, General (D) Class, and Technician (D) Class when qualifying for a license under the provisions of § 97.27.

NOTE: Credit for examination elements will be given to applicants holding a valid operator license at the time of the adoption of this rule, in accord with the following schedule, during a period not exceeding one year following the expiration date on the current license:

(1) Amateur Extra Class: All examination elements.

(2) Amateur Extra (C) Class: Elements 1(A), 2(A) and 2(B). Also all other examination elements as if passed on the basis of § 97.27.

(3) Advanced Class: Elements 1(A), 1(B), 2(A), 2(B), 3(A), 3(B), 4(A), and 4(B).

(4) Advanced (C) Class: Elements 1(A), 2(A), and 2(B). Also elements 1(B), 3(A), 3(B), 4(A), and 4(B) as if passed on the basis of § 97.27.

(5) General Class: Elements 1(A), 1(B), 2(A), 2(B), 3(A), and 3(B).

(6) Conditional Class: Elements 1(A), 2(A), and 2(B). Also elements 1(B), 3(A), and 3(B) if passed on the basis of § 97.28.

LETTERS

ou goons don't ever proofr
lousy
bunch of rocks
you ignored my comments in
I insist that you print ev

ANOTHER TROUBLEMAKER

Please take your magazine and shove it — into my new mailbox.

Sundry folk say you're biased, muck-raking, and print too much on subjects other than ham radio. So what? I get two ham mags, and yours is the one which gets read first and more thoroughly (even with the small type).

Maybe it's because I'm a gadfly myself in other areas, that keeps me behind you — just don't let me forget to renew, or you'll really get a nasty letter.

Jim Tolson WA9JTW

HE KEEPS UP

Personally, I find the satellite interesting — even after 42 years as a ham! For example, I have four uplink antennas and three downlink antennas, all on coax switches. Changing from one to the other is most educational, as you can imagine. Listening, with your own ears, to the results of your tests by monitoring your own downlink signal on 29 MHz, leaves no room for inflated reports, baloney reports, etc., etc. Very illuminating. I also, with a Variac, have changed transmitter output from 35 Watts to 1 Watt and observed what happened.

Stuart D. Cowan W2LX

MORE FAN MAIL

Would you like some fan mail? Here it is!! First I am not a Ham or Radio Amateur. I am just interested in general electronics and its many applications. Also since I work with Low Light Level TV on AC-130 gunships in Thailand, I am also interested in electronics as it applies to TV both transmitted and closed circuit. I like the idea of your proposed Solid State column. The only problem is I can't decide which columnist from the samples published would be the best, they are all good! As for your publishing your problems with the IRS, KEEP DOING IT!!! Maybe if more people spoke up the US Internal Police Service would be put back in the normal judicial system where it belongs.

Ralph A. Linder Jr.

RESPONSE TO "FAN MAIL"

Under the "Fan Mail" section, the letter from K6BR should be disregarded. Hillsborough, California is a town reserved for the VERY RICH. Obviously Mr. Naylor can be critical of you and your tax problems. He probably has never had to pay any. And he probably owns several shares of stock in the IRS.

Alan Christian WA6YOB

PROBLEM SOLVED

The Baltimore Amateur Radio Club maintains a machine on 07/67. Sometime this month the present 07/67 will switch to 34/94. This will be a calling repeater only, with 30 seconds time out. Once it times out it will take 30 seconds to reset, so it won't be much good for anything except a quick call. BARC is putting up a whole new repeater on 07/67 which will have a lot better coverage.

What they eventually want with the calling repeater is for everyone to monitor 94. Then you can make a call and switch to a rag chewing repeater. The way it is now is I have to call people on as many as 4 repeaters before I find the one they are monitoring. A calling repeater will solve this problem.

Steve Uhrig WA3SWS

EXPERIMENTERS NEEDED

Wanted: Serious, qualified, intelligent hams interested in vital fundamentals of life to read the "Fields of Life" by Dr. Harold S. Burr, Ballantine paperback 23559 $1.50 and/or "Design for Destiny" by Ed. W. Russell, Ballantine 23405 $1.25 and then develop suitable direct current amplifiers that are stable and can be duplicated with reliability and economy so that these Fields of Life can be measured in millivolts with extremely high input resistance. To be used with ordinary test meters such as 20k ohms per volt VOM. Special electrodes needed too.

Use in family planning and as an indicator of disease. It gets down to what really makes us tick and where we go from here. From Ballantine Books Inc., 201 E. 50th St., NYC 10022 plus two bits postage per order. Doctors and others here interested. All correspondence answered.

Charles A. Moore XE1CMB
Av. 27 Poniente 2520
Puebla, Puebla, Mexico

RF CLIPPER

That Clipper is built around the low cost filters from Amperex. I checked with the company. They are no longer in Houppauge and dropped the filter line. The Clipper is good but other sources of filters have to be found.

Kurt Bittmann WB2YVY

Can't win 'em all. . . Wayne

?

In reference to 73 Magazine, Sept. '74 page 27. I was reading the address of the author of "A Ham Radio Severe Weather Warning Net". Is the street number printed correct, or was the typist thinking about transistors while writing the draft.

. . . WA3RSP

While the typist MAY have been thinking about transistors at the time, she also had her mind on her work. Yes, the address is correct.

. . . Wayne

Continued on page 131

(7) Conditional Class (P) Class: Elements 1(A), 2(A), and 2(B). Also elements 1(B), 3(A), and 3(B) as if passed on the basis of §97.27.

(8) Technician Class: Elements 1(A), 2(B), 3(A) and 3(B).

(9) Technician (C) Class: Elements 1(A), 2(A), and 2(B). Also elements 3(A) and 3(B) as if passed on the basis of §97.28.

(10) Novice Class: Elements 1(A) and 2(A).

(b) Upon request, an applicant for an amateur radio license will be given credit for element 1(A) and 1(B) if within 5 years prior to the receipt of his application by the Commission, he held a commercial radiotelegraph operator license or permit issued by the Federal Communications Commission.

(c) Upon request, an applicant for an amateur radio operator license will be given credit for elements 1(A), 1(B), and 1(C), if he holds a valid First Class commercial radiotelegraph operator license or holds any commercial radiotelegraph operator license or permit issued by the Commission containing aircraft radiotelegraph endorsement.

(d) Applicant submitting evidence of having held the Amateur Extra First Class operator license and having held its successor license will be given credit for examination element 1(C) if he so requests. An applicant must present his proof in advance of the desired examination time to the Amateur and Citizens Division, Washington, D.C., 20554 and receive a letter of certification for presentation to the Commission Field Office where the examination will be taken. No credit for the telegraphy requirement will be given without the letter of certification.

9. Section 97.27 and headnote are revised to read as follows:

§97.27 Availability of operator license to physically disabled persons.

If it is shown by physician's certificate an applicant is unable to travel to any regular Commission examination point because of a protracted physical disability, a new or renewed Extra (D) Class, Advanced (D) Class, Experimenter (D) Class, General (D) Class, or Technician (D) Class operator license may be issued on the basis of examinations successfully passed under the provisions of §97.30. These licenses may not be renewed without a current physician's affidavit.

10. Section 97.28 and headnote are revised to read as follows:

§97.28 Availability of operator license to persons residing at great distances from Commission examination points.

(a) A new Advanced (C) Class, Experimenter (C) Class, General (C) Class, or Technician (C) Class license may be issued on the basis of examinations successfully passed under the provisions of §97.30 under one of the following conditions:

(1) If the applicant's legal residence, mailing address, and/or any station location or proposed station location are more than 175 miles actual distance from the nearest Commission examining point.

(2) If the applicant is shown by certificate of the commanding officer to be in the armed forces of the United States at an Army, Navy, Air Force, or Coast Guard station and, for that reason, to be unable to appear for examination at a Commission examination point.

(3) If the applicant demonstrates by sufficient evidence that he is unable to appear at a Commission examination point because his current temporary residence, for the 12 coming months is outside the continental limits of the United States, its territories or possessions.

(b) Operator licenses obtained under the provisions of these rules are not renewable.

11. Section 97.29 and headnote are revised to read as follows:

§97.29 Manner of conducting Commission supervised examinations.

(a) Except as provided by §97.27 and §97.28, examination elements 1(B), 1(C), 3(A), 3(B), 4(A) and 4(B) may only be administered by an authorized Commission employee or representative at locations and at times specified by the Commission.

(b) Examination element 4(A) may only be administered to a person having successfully passed element 3(C).

(C) Examination element 4(B) may only be administered to a person having successfully passed element 3(B).

(d) Examination element 3(A) may only be administered to a person having successfully passed element 2(A).

(e) Examination element 3(B) may only be administered to a person having successfully passed examination elements 2(B).

12. Section 97.30 is added new to read as follows:

§97.30 Manner of conducting mail examinations.

(a) Unless otherwise prescribed by the Commission, examination elements 1(A), 2(A), 2(B), and any elements administered under the provisions of §97.27 and §97.28 will be conducted and supervised by two proxy volunteer examiners proposed by the applicant and approved by the Commission. The volunteer examiners shall be at least 21 years of age, shall be unrelated to the applicant, and at least one shall hold the proper class of license to administer examinations in accordance with the following schedule:

(1) Extra Class: All examination elements.

(2) Advanced Class: Examination elements 1(A), 1(B), 2(A), and 3(A).

(3) Experimenter Class: Examination elements 1(A), 2(B), and 3(B).

(b) Written examinations shall be obtained, administered, and submitted in accordance with the following procedure:

(1) Within 10 days after successfully passing any required telegraphy examination element, an applicant shall submit an application (FCC Form 610), together with any filing fee prescribed, to the Commission's office in Gettysburg, Pennsylvania 17325. The application shall include a written request from the volunteer examiners for the appropriate examination papers. The examiners' written request shall include (1) the name and mailing address of the volunteer examiners, (2) the name of the applicant, (3) a statement by the volunteer examiners that the applicant has passed the telegraphy examination element for the class of operator license, if required, under their supervision within the 10 days prior to the submission of the request, and (4) the volunteer examiners' signatures. Examination papers will be forwarded to one of the volunteer examiners.

NOTE: When the applicant is entitled to credit for any telegraphy examination element under the provisions of §97.25, an application may be submitted without regard to the 10 day limitation. The examiners' request should then state that a telegraphy examination was not administered for that reason. The applicant should furnish details as to the class, number, and expiration date of any license involved.

(2) The proxy volunteer examiners shall be responsible for the proper conduct and necessary supervisions of the examination. Administration of the examination shall be in accordance with the instructions included

with the examination papers.

(3) The examination papers, either completed, or unopened in the event the examination if not administered for whatever reason, shall be returned by the volunteer examiner to the Commission's office at Gettysburg, Pennsylvania, no later than 30 days after the date the papers are mailed by the Commission (the date of mailing is normally stamped by the Commission on the outside of the examination envelope).

13. Section 97.33 is amended to read as follows:

§97.33 Eligibility for re-examination.

An applicant who fails an examination for an amateur radio operator license may not take another examination for the same or higher class license in the same series within 30 days.

14. Section 97.35 and headnote are revised to read as follows:

§97.35 Additional requirements for licensees holding licenses on the basis of mail examinations.

(a) A licensee holding an amateur radio operator license obtained by a mail examination administered by proxy volunteer examiners may be required to appear for a Commission supervised examination at a location designated by the Commission. If the licensee fails to appear for this examination when directed to do so, or fails to pass such examination, the amateur radio license(s) involved shall be subject to cancellation. When a license is cancelled under this provision, a new license will not be issued for the same class of operator license as that cancelled.

(b) A holder of an amateur radio operator license obtained on the basis of a mail examination under the provisions of §97.27 shall make application for re-examination within one-year upon becoming able to travel to any Commission examination point.

(c) A holder of an amateur radio operator license obtained on the basis of mail examination under the provisions of §97.28 shall apply for re-examination within one-year of when the licensee changes his legal residence, or mailing address, and/or any station or proposed station location within 175 miles actual distance to the nearest Commission examination point, or when a new examination point is established within 175 actual miles distance to the licensee's legal residence, mailing address, or station location.

15. Section 97.38 is added new to read as follows:

§97.38 Types of station licenses and eligibility.

(a) The following types of station licenses are available to properly licensed amateur radio operators.

Type of station	Eligible licensees
Series A Primary station.	Extra Class, any Series A Class operator.
Series A Secondary station.	–do–
Series B Primary station.	Extra Class, any Series B Class operator.
Series B Secondary station.	–do–
Series A Club station.	Extra Class, Advanced Class operator.
Series B Club station.	Extra Class, Experimenter Class operator.
Repeater station, Control station, Auxiliary Link station, Space station.	Extra Class, Experimenter Class operator.
Military Recreation station.	Individual, whether or not a licensed amateur radio operator, who is in charge of a proposed Military Recreation station.

16. Section 97.67(a) & (b) are amended and part (d) added to read as follows:

§97.67. Maximum authorized power.

(a) Within all other limitations specified herein, amateur radio stations shall use the minimum amount of transmitter power necessary to carry out the desired communications.

(b) Except for power limitations set forth in §97.7 and §97.61, the maximum transmitter output power shall not exceed 2000 watts peak envelope power.1/

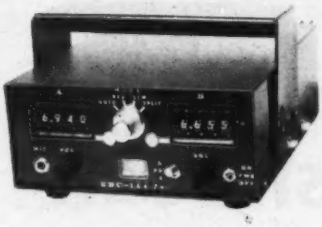
(d) Any transmitter capable of exceeding the power limitations specified herein shall not be operated in the Amateur Radio Service unless there is incorporated adequate measures to insure the limitations will not be exceeded.

1/ This is one proposal under consideration. The Commission is also considering alternatives such as PEP-input, average power input, ratios of peak to average power output and limitations on dissipation ratings of final power amplifier devices or a combination of these. Specific comments on the practicality of these proposals, alternate proposals and the practicality of attendant power measuring techniques by amateur stations are requested.

We request comments on the need for rules limiting the use of techniques which increase the average power in A3 single sideband suppressed carrier transmissions, without increasing the peak envelope power. The comments should discuss the various techniques utilized for the purpose in the Amateur Radio Service, the engineering standards that must be observed for good amateur practice when using these techniques, the nature of any unnecessary interference that can be caused by the improper use of these techniques, and the capabilities of amateurs to make measurements necessary to proper usage.

Station Identifier
$75
control signal company denver
CWID 50
The CWID-50 provides automatic ID for repeater stations in perfect Morse code. Has factory-programmed IC memory. Brochure describes CWID-50 and CWID rack models.
control signal co
5964 W. COLUMBIA PLACE DENVER, COLORADO 80227

SYNTHESIZED FM TRANSCEIVERS



EBC 144 JR

$599.00

HEY! This is like two transceivers in one! Fully synthesized covering 143.5 to 148.5 MHz in 5 kHz increments. Standard 600 kHz offsets up or down automatically. Reverse simplex and frequency split allow totally independent receive and xmit frequencies, and a priority channel guard that switches you back to it as soon as a signal is detected.

- Sensitivity – .35μV for 12 dB sinad, .30μV for 20 dB quieting
- 20 watts output
- Intermodulation, spurious and image 60 dB minimum
- 10 pole xtal filter
- Frequency stability .001%
- S-meter speaker built in
- Independent selectable priority channel

Here it is, the FMer's dream, a fully synthesized transceiver that'll cover the entire two meter band, PLUS a built-in scanning receiver that'll locate any repeater frequency in your area that's in use. . .

EBC 144

$1495.00

- Frequency stability of 0.0005%
- Built-in tone burst and PL encoders and decoders
- Built-in touch tone pad
- Full LED Digital readout
- Built-in S Meter also serves as VSWR bridge, power output meter, battery indicator, deviation indicator and discriminator meter
- Audio output 4 watts @ 10% THD
- Speaker built-in to left side of cabinet for maximum mobile reception
- Headphone jack for noise-free mobile operation
- Independent selectable priority channel
- Built-in Auto CQ
- Temperature range from −20° to 170° Fahrenheit
- Size: 4" H x 8" W x 10" D Weight: 10 pounds
- One million channels (1000 Rec. x 1000 Trans.)
- Operates on FM, AM or Modulated CW
- Built-in DC and AC power supplies
- Frequency range of 143.5 to 148.5 MHz in 5 kHz increments
- Autoscan in 5 kHz steps across entire band, with adjustable speed and frequency limits
- Synthesizer flexibility that offers choice of 600 kHz up or down, 1 MHz up or down, simplex, frequency split, or any nonstandard split (programmable) all from a single function switch
- Receiver sensitivity of 0.35 mV for 12 dB SINAD on FM
- Dual power output of 20 watts or 5 watts across entire band
- Adjacent channel rejection (30 kHz) 100 dB minimum
- Image spurious and intermodulation (EIA) 80 dB minimum
- 10 pole, 13 kHz crystal filter

15A River Street
New Rochelle NY 10801

emergency beacon corp.

E.H. Sommerfield W2FJT
49 Spring Road
Poughkeepsie NY 12601

Sneaky Fast Scan Monitor for SSTV

When operating SSTV the use of a fast scan monitor provides the means to adjust the scene at a 15 frames/second rate rather than the standard 8 seconds/frame rate — a ratio in round numbers of 120:1. Commercial fast scan display units sell for about $250. Oscilloscopes now sell in the $120 range and are usually large and bulky. Who wants to tie up a scope for display only? This article describes modifications that can be made to a standard Heathkit monitor scope, found in many stations, to provide the fast scan display feature for the popular Robot 80A Camera.

The modification is based upon the assumption that the trapezoidal display found in the HO-10 is seldom used. I have used it only once in 5 years.

Circuit Descriptions

Vertical Amplifier

The vertical amplifier, Fig. 1, was modified to satisfy two criteria:

1. Maximum sensitivity to a positive sawtooth at V1A.
2. No voltage transients on external vertical input line when mode switch is operated from display to EXT.

The vertical fast scan signal, from the 80A camera, is taken directly from the vertical yoke. This is a positive going sawtooth with a negative magnetic overshoot. C7 is used to minimize that overshoot. Notice that the coupling capacitor C3 is located on the input

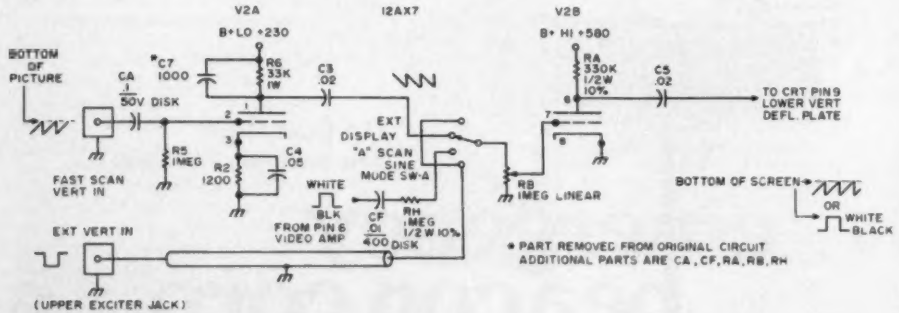


Fig. 1.

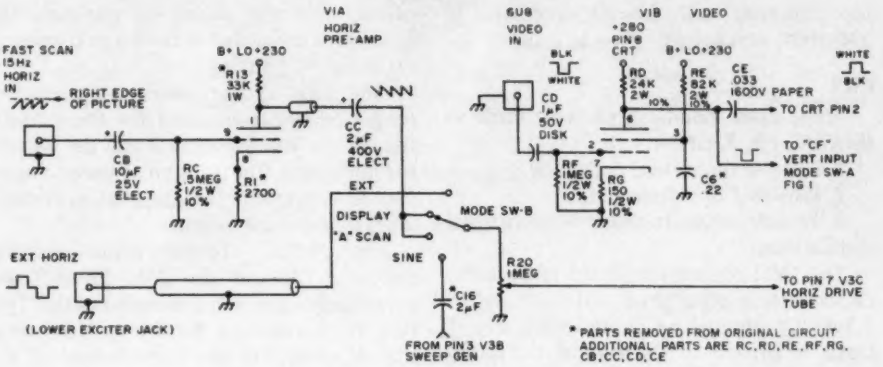


Fig. 2.

side of mode switch-A to prevent voltage transients from being applied to the external vertical input line when the mode switch is operated. Such voltage transients could damage external semiconductor circuits.

Horizontal Amplifier

The horizontal fast scan signal from the 80A camera is a positive going sawtooth. The amplitude of this signal is about the same as the fast scan vertical signal and requires two stages of amplification, Fig. 2. V1A the horizontal preamplifier must pass a 15Hz signal which accounts for the large capacitances (CB,CC). Notice also that both coupling capacitances have been moved to the input side of mode switch-B. This was done, as in the case of the vertical amplifier, to prevent voltage transients from being applied to the external horizontal input line when the mode switch is operated.

Video Amplifier

The HO-12 has no provision for video, or Z input. A video amplifier, Fig. 2, described by ROBOT in their Field Service note #4 was installed in V2B. This circuit is sensitive to negative pulsing signals. The video grid resistor, RF, or the bias resistor, RG, can be made variable for gain control. I found 150Ω for RG satisfactory using the intensity control to vary the display. If the display is

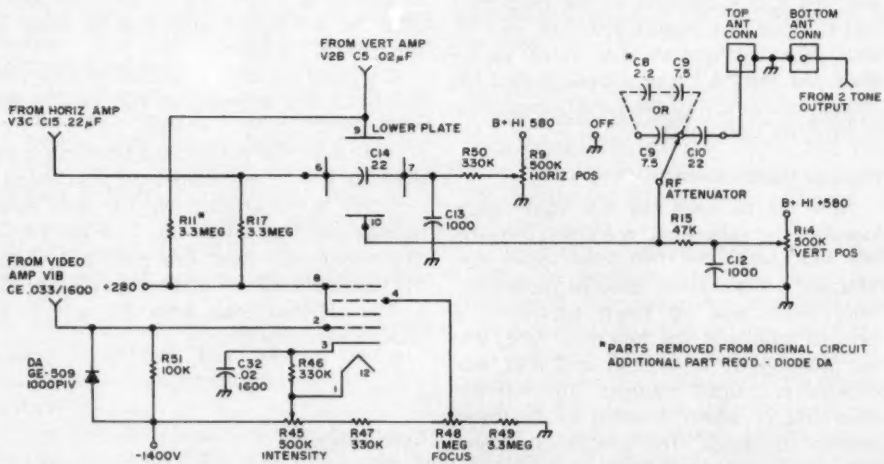


Fig. 3.

too contrasty RG can be increased to 240-300Ω as required.

CRT

Three basic modifications were made to the CRT, Fig. 3, circuitry to:

1. Increase the vertical deflection.
2. Provide Z or video input.
3. Provide means to shut off the rf signal vertical input.

The 1MΩ resistor connected to the vertical deflection plate pin 9 was increased to 3.3μM. C8, through which the lowest level rf signal is applied to the vertical deflection plate, was removed and the switch point grounded to provide a means to shut off the rf input. This allows the display to be viewed while the picture is being transmitted — good if you're prone to move. In most cases it is not necessary to view the rf unless setting up or in case of troubles.

Mode Switch/"A" Scan Feature

The mode switch was changed from a 2-pole 3-position to a 2-pole 4-position switch, see Figs. 1 and 2. The currently installed mode switch has 2-poles 5-positions with only 3 being used, and can be modified with some difficulty. I recommend a new 2-pole 4-position switch.

The extra position allows amplified fast scan video to be applied to the vertical input and fast scan deflection to the horizontal input. These two signals result in an "A" scan, allowing synchronized video to be displayed. An "A" scan display is used for precise adjustment of the camera brightness control (see operation).

Physical Modification

In order to keep the fast scan signals together, the video input was entered via the two tone jack. The two tone signal was relocated to the lower antenna connector. Since there was no room to mount a terminal strip near the two tone tube, V4, the junction of R30, R38 and R52 was soldered to a short length of stiff wire the other end of which connects to the lower antenna connector. The junction is, therefore, self-supporting. In order to prevent the junction from shorting to pot R29 a strip of plastic tape was placed on the pot. The antenna is connected to the single connector via a coax "T" fitting.

The two exciter connectors, now no longer needed, were used for the external inputs; the top for vertical and the bottom for horizontal. The location of these connectors is convenient for connecting shielded wires to the mode switch.

The .003μF. 1600V video coupling capacitor CE and the 24K 2W RD are connected via a 3 lug terminal strip. This strip is mounted on the side of CRT neck that is closest to the bottom side of the chassis. It is mounted using the same screw that mounts a terminal strip already in this

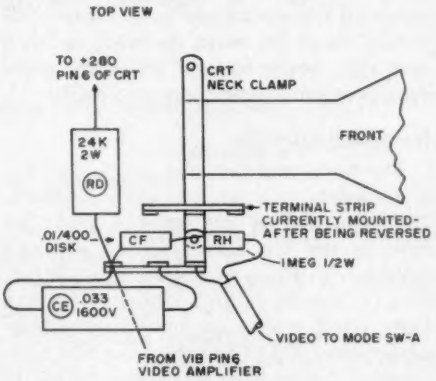


Fig. 4.

location, Fig. 4. The strip currently mounted must be positioned such that its body is towards the CRT neck.

Coupling capacitors 2μF 600V CD, and .02μF C3 are mounted in the area of the mode switch.

The .22μF C6 is relocated from pin 8 to pin 3 of V1. Do not remove the ground end.

Don't physically remove the wire connecting pin 7 of V1 to pin 7 of the CRT. This wire is later used from pin 6 of V1B to the .033/1600 CE located on the CRT neck.

The shielded lead from V1 pin 2 is relocated to V1 pin 1.

External Inputs

Two external inputs, vertical and horizontal, were wired to the mode switch to

Operation

	Mode Switch			
HO-10	Sine	A-Scan	Display	Ext.
Intensity	Adjust to level to eliminate "Z" modulation	Normal	Black looks black	As desired
Focus	As required for intensity.			
Vertical gain and Position	As required but below overload level.			
Horizontal and Position		As required.		
Sweep Frequency	As required	N/A	N/A	N/A
Rf Attenuator (in rear)	As required	Off	Off/On When on, SSB rf overlays display during transmission, but can still be seen.	Off

permit attachment of an audio frequency spectrum analyzer or other device. The sensitivity of the vertical input is too negative pulsing. The sensitivity of the horizontal input is either polarity. Note that both external inputs are direct, not ac coupled. This was done in order to keep these inputs flexible. This allows the coupling capacitors to be matched to the external signal source frequencies and voltage polarities.

Power Supply Considerations Under No-Signal Input Conditions

The 6BN8 required 600mA of filament current. The 12AT7/12AX7 requires only 300mA, a net reduction of 1.9W.

The original V2B required 7.2mA at 580V, the revised V2B requires about 1.5mA at 580V – a net savings of 3.3W.

The new horizontal preamp requires 3.3mA at 230V or an additional .76W.

The new video amplifier requires 4.9mA at 230V or an additional 1.2W.

The net high voltage current drain is plus 1.5mA.

These values will vary of course, under signal conditions. But the net change is towards less power consumption.

Chart

In order to adjust camera brightness, set mode switch to "A" scan. Black will be towards the top of the screen and white will be towards the bottom of the screen. Adjust camera brightness for maximum difference between black and white signals levels. Notice that any further increase in brightness causes an increase in the overall down position of the vertical spikes (background shading), but does not increase the white to black ratio of the picture elements. This can be checked by switching to the display mode and "rocking" the brightness control either side of the optimum setting. The contrast can now be adjusted by looking at both display and "A" scan positions of the mode switch and touching up the brightness as required.

Conclusion

The display obtained with these modifications completely fills the screen and then some. The linearity of the display is not of TV quality but is more than sufficient for this application.

The camera was operational for one week before the modifications to the HO-10 were completed. The difference in performance and picture quality and the ease which they are obtained, has definitely established the need for Fast Scan Display. The estimated cost of $11 for new parts is, without a doubt, a good investment to increase the versatility of an already valuable piece of monitoring equipment. ...W2FJT

RADIO LIFE-INSURANCE IS STANDARD... FROM STANDARD

Only Standard offers you an Amateur Radio with a "no-fault" Life Insurance Policy that can save your radio and your pocketbook, should your Standard ever need service after its regular 180 day Warranty expires.

Your "out-of-warranty" cost

Model SR-146
Model SR-146A } $32.00 total

Model SR-C806
Model SR-C826 M
Model SR-C826 MA } $38.00 total

Repeater RPT-1 $59.00 total

Our exclusive Astropoint Radio Life Insurance Policy costs nothing at time of purchase, and will guaranty you a flat rate for repair after the regular 180 day free warranty expires. After an "out-of-warranty" repair, it will be re-warranted for an additional 30 days. No hidden costs beyond the flat rate repair charge listed above from our factory in Wilmington, California.

Flat rate includes:

Repair of all faults in radio
Complete TX and RX alignment & tuneout
Modification updates made
Channels frequency aligned*
FM Certificate issued
Sealed in plastic & returned to you

Suggested retail:
$698 RPT-1 complete

*Note: All Standard Astropoint crystals are lifetime guaranteed FREE.

Suggested retail: **$398**
SR-C826 MA with
all channels included!

Suggested retail: **$298**
SR-C146A with
5 channel
capability.

See your Standard dealer for more information on Standard's Radio Life Insurance Policy.

Standard Communications

213/835-3134 • 639 North Marine Avenue, Wilmington, California 90744

Richard Winkelman K6ZN
Henry Olson W6GXN
P.O. Box 995
Menlo Park CA 94025

Behold! — Super-key

Most electronic keyers either do not offer a variable dot-to-dash ratio, or if they do, than the dot-to-dash ratio usually changes with speed or weight. Timing is normally done by a multivibrator, which inherently causes the dot-to-dash ratio to vary with speed or weight. To solve this problem, a keyer was constructed which uses an integrator as the timing element. This circuit offers the following features:

1. A single potentiometer adjusts the speed continuously over a 3 to 1 range, and a switch changes ranges. Changing the speed has no effect on the ratio of dots to dashes or the weight (on-to-off time) of a character.
2. A single potentiometer adjusts the ratio of dots to dashes by changing the speed of the dots but not the dashes. This adjustment does not affect the weight.
3. The weight is controlled by two separate potentiometers, one for dots and one for dashes. These adjustments are not interacting and do not affect the speed or ratio.

4. Characters are self-completing. When a dot or dash is started, it is automatically completed and a space inserted between it and the next character.
5. Dot insertion is used. This permits dots to be inserted between a train of dashes, without releasing the dash key.

Fig. 1, shows the circuit which forms a dot or dash. An operational amplifier is used as an integrator. An operational amplifier is simply a very high gain amplifier. As far as the external circuit is concerned, the operational amplifier can be considered to have infinite gain, infinite input impedance, and a low output impedance. In Fig. 1, the two inputs to the operational amplifier are labeled (-) and (+). When a capacitor is connected between the output and the inverting input (-), it becomes an integrator. It is called an integrator, because all of the current, i_1, must flow into the capacitor, C, and the output voltage V_O adjusts itself so that the capacitor voltage is equal to the integral of the current, i_1, divided by C. In other words, the capacitor voltage, V_O, equals:

$$\int \frac{i_1\, dt}{C} = \frac{\bar{i}_1\, \Delta t}{C}$$

where i_1 is the average current over a time interval, Δt. If S1A is closed and S1B is open, then $i_1 = +V_1/R_A$ flows into C, and the output voltage, V_O, falls linearly from V2 to V3, as shown in the graph, Fig. 2. If at time t_1, S1A is opened and S1B is closed, then $i_1 = -V1/R_B$ flows into C. V_O then starts rising from V3 toward V2. When V_O

reaches V2, if S1A and S1B are reversed again, the cycle repeats. V_O is fed to a flip flop which changes state each time V_O reaches V2 or V3, as shown in the graph in Fig. 2. The flip flop powers the switch S1. The flip flop also forms the dashes and dots. When the flip flop is in the ON state a dash (or dot) is being made, and when in the OFF state the spacing between dashes (or dots) is formed. In the practical circuit two R_1s are used and are switched in and out electronically. The smaller R_1 is used for dots and the larger R_1 for dashes. As the setting of the potentiometer arm changes, R_A and R_B change in such a manner that their sum is always equal to R1. It can be demonstrated that even though t1 changes as the potentiometer is varied, t2 does not change. In other words, the ON time plus the OFF time of a character is constant. Thus, variation in the weight has no effect upon the speed. Because there are two R1s, one for dashes and one for dots, the weight of dashes and dots are independently variable, and neither has any effect upon the speed. The ratio of dots to dashes is controlled by changing the value of V1 as the dot and dash potentiometers are switched in and out. That is, a different value of V1 is applied to the dash potentiometer than is applied to the dot potentiometer. The ratio of dots to dashes changes, because the speed of a character is directly proportional to V1.

Fig. 4, shows the logic block diagram, Fig. 5, the circuit diagram of the keyer, and Fig. 6, the circuit diagram of the power supply and sidetone oscillator.

In the ensuing discussion, the logic gates shown in Fig. 4, are called NOR gates and work in the following manner. A schematic diagram of the Motorola MC724P quad 2-input gates is shown in Fig. 3. Each package contains four separate two input gates. Let us illustrate with gate U3 (pins 12, 13, and 14), in the lower left hand corner of Fig. 4. Zero or low voltage is called logic "0" level. Positive or high voltage is called logic "1" level. If inputs 12 and 13 are both at zero voltage or "0" level, then the output on pin 14 is at "1" level. At a "1" level output, both of the gate transistors are open circuited, and the output terminal is driven by a 640Ω resistor to +3.6V. If either input 12 or 13, or both, are at logic "1," then one or the other gate transistor, or both, are saturated, and the output terminal is at logic "0," because the transistors effectively act as a short circuit to ground.

In the logic block diagram Fig 4, when the dash key is closed, the output of gate U3 at pin 14 rises to the "1" logic level. This assumes that pin 12, U3, is at the "0" level, which it will be if the dot control flip flop is in the quiescent state. When pin 14 (U3), rises, pin 14 (U1), drops to the "0" level. In the quiescent state, the "recharge" flip flop places a "1" level at pin 3 (U7), and pin 9 (U7), and a "0" level at pin 8 (U7), and pin 7 (U4). Therefore, pins 6 and 7 (U4), are both at "0," which causes a "1" at pin 5 (U4), which triggers the dash formation flip flop to the ON state. Pin 5 (U1), is changed from "0" to "1," which does several things. This causes pin 8 (U4), to move to the zero state, which means that the dash key can be released, and the dash control flip flop will still remain in the ON state. All of the foregoing happens in about a microsecond, which means that a slight touch of the dash key is all that is necessary to start a dash.

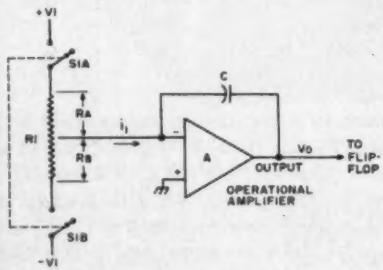


Fig. 1. Simple character formation circuit.

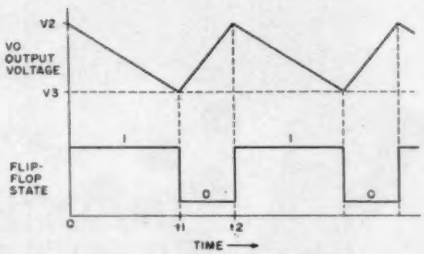


Fig. 2. Timing diagram of operational amplifier circuit of Fig. 1.

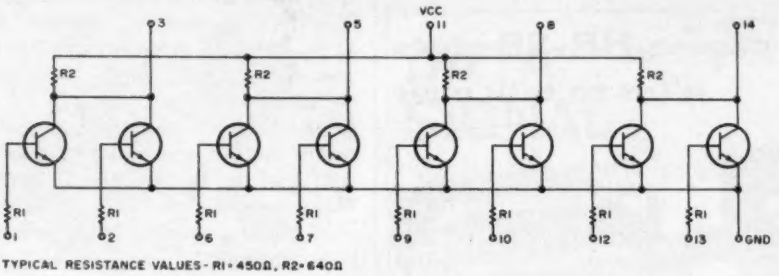


Fig. 3. Motorola MC 724P quad 2-input gate.

When pin 5 (U1), goes to "1," this turns off the recharge current source by causing pin 14 (U4), to drop to "0." The dash charge current source is turned on, which causes a constant charging current to be fed to the operational amplifier, U8. When pin 5 (U1), goes to "1," the base of Q5 goes to +1.3V, and about 1/3 milliampere of current flows through Q5 to Q4, which turns on and saturates Q4.

When Q4 is saturated, the voltage from emitter to collector is nearly 0V, which means that the voltage at the emitter of Q3 is applied directly to the top of R17. The voltage at the center arm of R33 is connected to the (-) input of the operational amplifier, U8. The trimpot, R50, is adjusted so that the (-) input remains within a millivolt of ground potential. A current flows from the emitter of Q3, through Q4, R17, and R33, into C4, C5, or C6 (whichever is connected). The magnitude of this current is equal to $V_a/(R_{17}+R_a)$, where V_a is the voltage at the base of Q3, and R_a is the resistance from the top of R33 to the center arm. As discussed earlier, the operational amplifier integrator causes the integrating capacitor to charge at a linear rate. The quiescent value of the voltage on the integrating capacitor is +9V. It is clamped at this level by the voltage divider action of R20, R36, and Q11. When the charging current flows into the integrating capacitor, the voltage starts falling linearly from +9 toward -9V. When it reaches -9V, the voltage divider action of R29 and R30 turns off

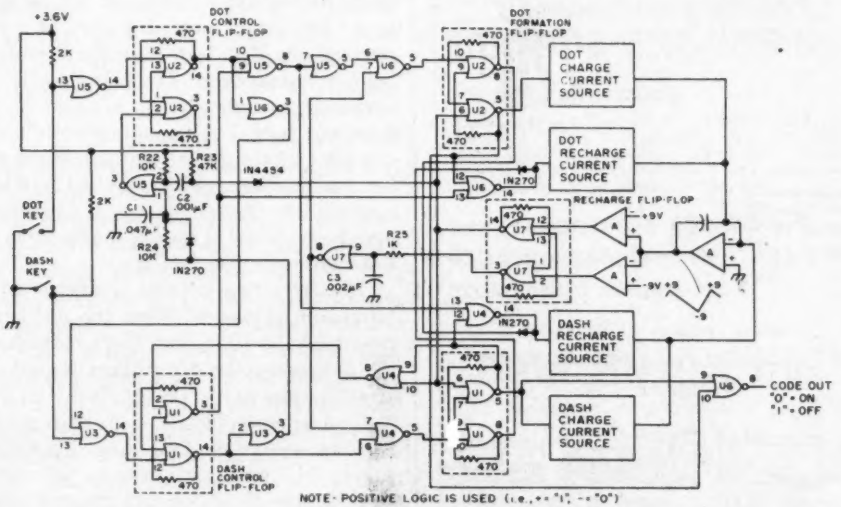
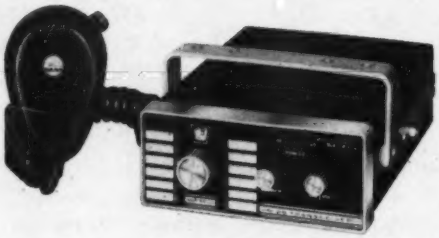


Fig. 4. Logic block diagram.

Regency HR-2B gives a lot to talk over



American Made Quality at Import Price

Full 12 Channel, 15 Watts with HI/LO power switch

Here is everything you need, at a price you like, for excellent 2 meter FM performance. The 12 transmit channels have individual trimmer capacitors for optimum workability in point-to-point repeater applications. Operate on 15 watts (minimum) or switch to 1 watt. 0.35 uv sensitivity and 3 watts of audio output make for pleasant, reliable listening. And the compact package is matched by its price. **$229.00**

Amateur Net

Regency ELECTRONICS, INC.
7707 Records Street
Indianapolis, Indiana 46226

An FM Model For Every Purpose . . . Every Purse

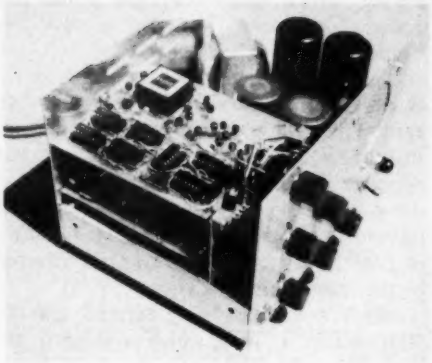
HR-6
12 Channel-25 Watt
6 Meter FM Transceiver

HR-220
12 Channels-10 Watts
220 MHz FM Transceiver

ACT 10-H/L/U
3 Band-10 Channel FM
Scanner Receiver

Q12, which applies a positive voltage to pin 2 (U7), which sets the "recharge" flip flop to the ON state. In the ON state pin 14 (U7) goes to "1" level, which resets the dash formation flip flop to the OFF state. This turns off the dash charging current and turns on the dash recharging current. When pin 5 (U1), goes to "0," pin 14 (U4), rises to "1." This assumes pin 13 (U4), is at "0," which it must be, because pin 9 (U5), is at the "1" level. When pin 14 (U4), rises to "1," about 1/3 milliampere of current flows through Q16 into Q18, which saturates Q18. The voltage drop from Q18 collector to emitter drops to nearly zero, and a current flows out of the integrating capacitor equal to $V_b(R_{35}+R_b)$, where V_b is the voltage at the emitter of Q19, and R_b is the resistance from the bottom of R33 to the center arm. This reverse current causes the integrating capacitor voltage to recharge from -9V back toward +9V. When +9V is reached, Q11 is again turned on, which clamps the voltage to +9. Q11 also turns on Q10, which applies a positive voltage to pin 12 (U7), which resets the recharge flip flop to the OFF state. Pin 14 (U7), goes to "0," which causes U4 (pin 8), to supply a "1" pulse to the dash control flip flop, resetting it to the OFF state. C3 and R25 insert a 2 micro-second time delay in the output of U7, this is so that the dash control flip flop can be reset to the OFF state, before pin 8 (U7), can fall to the 0 level. Otherwise, gate U4 (pin 5), could retrigger the dash formation flip flop, starting a new dash cycle. The dash cycle is now complete and everything is again in the quiescent state, awaiting initiation of a new character by the dash or dot key. If the dash key had not been released but had been kept continuously depressed, a new dash would have been started as soon as the recharge flip flop returned to the OFF state.

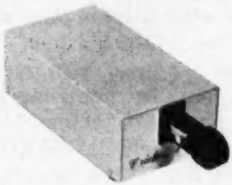
The formation of dots is similar to the formation of dashes. When the dot key is closed, pin 14 (U5), goes to "1," which sets the dot control flip flop to the ON state. Pin 10 (U5), goes to "0," and if pin 9 (U5), is at "0," which it would be if the dash control flip flop were in the OFF state, pin 8 (U5), goes to "1," pin 5 (U5), goes to "0" and U6 (pin 5), goes to "1," setting the dot formation flip flop to the ON state. This turns off



the dot recharge current, and turns on the dot charge current by turning on Q9, which saturates Q8. Q6 and Q7 are emitter voltage followers, so that the voltage at the center arm of R14 is applied to the top of R16, which causes a charging current to flow through the center arm of R34 into the integrating capacitor. The action of the integrator is exactly the same as for dashes, except that the integration is faster, because of higher charging current. The charging current is equal to $V_C/(R_{16}+R_C)$, where R_C is the resistance from the top of R_{34} to the center arm, and V_C is the voltage at the center arm of R14. Varying V_C by adjusting R14 changes the dot speed, which is directly proportional to the voltage V_C. It can be shown that with the center arm of R14 set at the top, the ratio of dash cycle time to dot cycle time is 3.1 to 1. By varying the setting of R14, this ratio can be lowered to as little as 1.7 to 1. When the integrator has charged from +9 to -9, the recharge flip flop is set to the ON state, which resets the dot formation flip flop to the OFF state. This turns off the charging current and turns on the recharge current by turning on Q13, which saturates Q14. The integrator recharges from -9 to +9, at which time the recharge flip flop is reset to the OFF state. The negative going reset pulse from pin 14 (U7), is differentiated by the network R23, C2, and R22, and passes through the gate U5 to reset the dot control flip flop to the OFF state. The differentiation network permits only the negative going leading edge of the pulse to do the resetting. The other input to

DATA SIGNAL

the latest in station accessories



CRICKET 1 ELECTRONIC KEYER

A popularly-priced IC keyer with more features for your dollar. Cricket I is small in size and designed for the beginner as well as the most advanced operator. It provides fatigue-free sending. Easy to copy at all speeds. Turn on its side and use as a straight key for manual keying. AC/DC.

Shipping Weight 3 lbs. $49.95

SPACE-MATIC 21-B

The Switchable Keyer. It's up to eight-keyers-in-one. Use the switches to make this your very own personal keyer, both today and tomorrow. Add such features as dot dash memory or adjust spacing with the turn of a switch. Completely perfect.

Sh. wt. 4 lbs. $119.50

TOUCH-TONE DECODER

A highly reliable twelve digit decoder with input protection, and PLL circuitry for extremely stable operation. Heavy duty output relays, small size, plug-in circuit board. All these major features at an UNBEATABLE price.

	Sh. wt. 1 lb.
TTD-12K Kit	**$114.50**
TTD-12 Touch-Tone Decoder	**$129.50**

Write today for complete details

Data Signal, Inc.

Successor to Data Engineering, Inc.

2212 Palmyra Road

Albany, Ga. 31701

912-435-1764

the U5 gate comes through the U3 gate from the dash control flip flop. When the dash control flip flop is on, U3 (pin 3), supplies a "1" level to pin 1 (U5), through the 1N270 diode. The "1" level prevents the dot control flip flop from being retriggered * until about 1/2ms after the dash control flip flop has returned to the OFF state. This permits the use of what is called "dot storage" or "dot insertion." During a train of dashes if the dot key is pressed, even for an instant, the dot control flip flop is set to the ON state. This places a "0" at pin 14 (U2), and a "1" level at U6 (pin 3), and U3 (pin 12). Gate U3 is then closed, causing the dash control flip flop to be reset to OFF at the end of the dash cycle. At that instant the dot control flip flop assumes control, and a dot is started. When the dot is completed, another dot will be started, if the dot key is still depressed. If not, the dot control flip flop is reset to OFF, which opens gate U3 and the dash control flip flop is again triggered, providing the dash key is still depressed. It can thus be seen how one dot or a string of dots can be inserted between two dashes without releasing the dash key. This is called "squeeze" or "dot insertion" keying, which some operators prefer. Of course, one does not have to use this "squeeze" feature.

The potentiometer R37 varies the speed. It does this by varying the voltage at the emitters of Q3 and Q19 in such a manner that these voltages are always equal but opposite in polarity. The voltage is divided down further by R14, to vary the dot speed relative to the dashes. R14 adjusts the ratio of dots to dashes. This ratio is not affected by the speed control, R37.

When a dash is being formed, pin 13 (U6), is at a "1" level, which produces a "0" level at pin 14 (U6), stopping the recharge current. Otherwise, it would interfere with the timing of the dash. Likewise U4 (pins 13 and 14) stops the dash recharge current while a dot is being formed. The diodes CR21 and CR22 serve no purpose except to prevent the dot and dash formation flip flops from latching up.

Code output is produced at U6 (pin 8), by combining the outputs of the dash and dot formation flip flops. Transistors Q1 and Q2 amplify the level, producing a 0 to +14V output pulse.

Fig. 6, shows the schematic diagram of the power supply and sidetone keyer. The power supply uses a Stancor transformer

*While the dash control flip-flop is in the on state, R24 and C1 prevent retriggering.

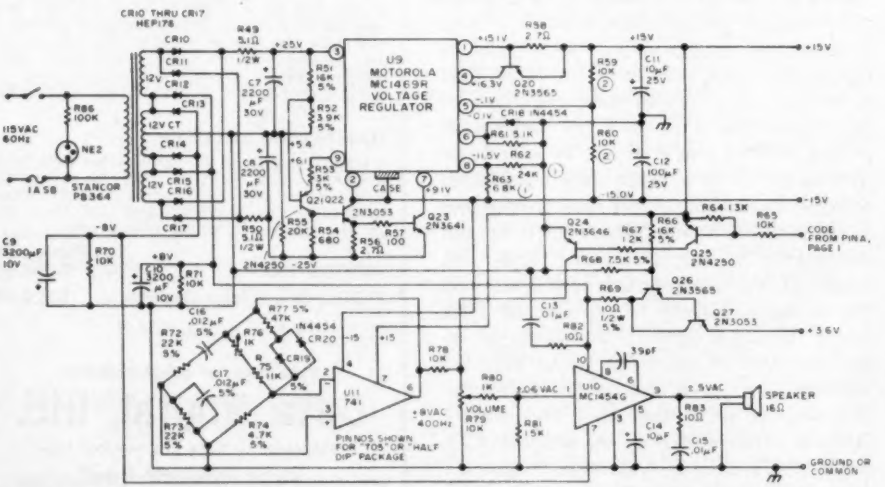
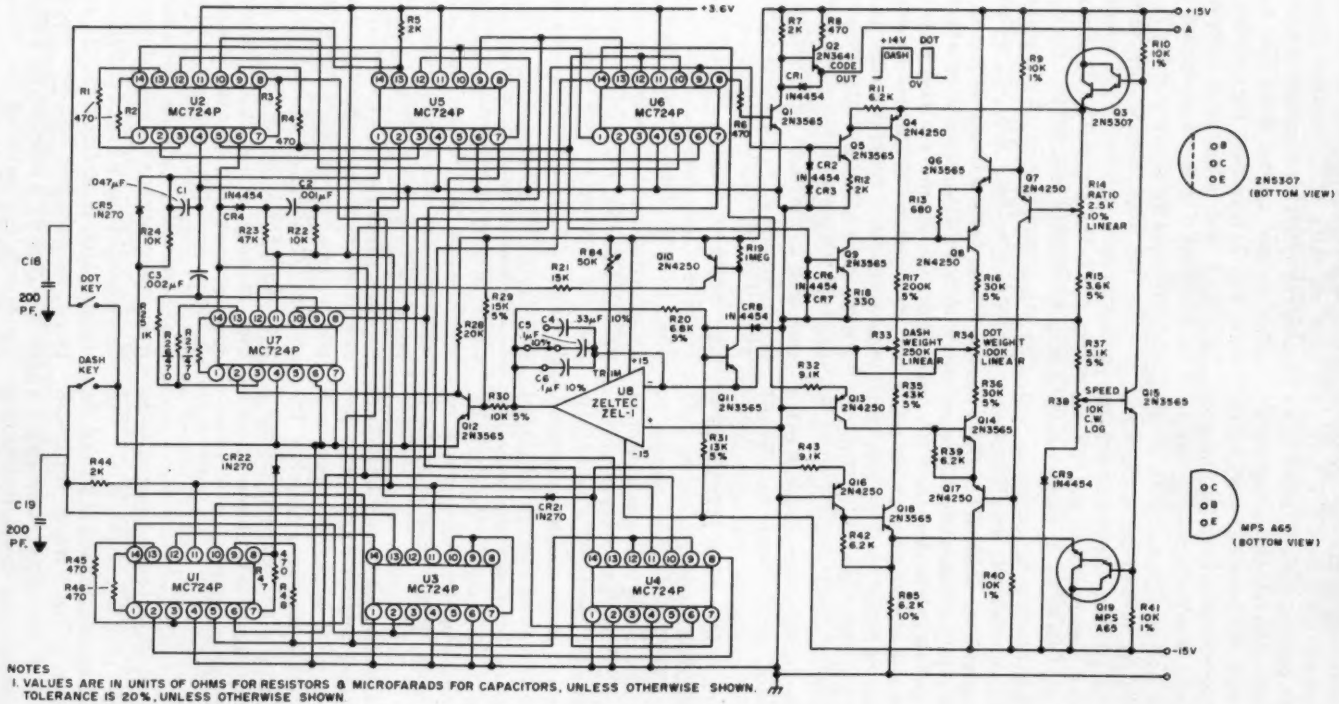


Fig. 6. Schematic of power supply and sidetone oscillator. Notes: 1. Select values of R62 and R63 which give exactly -15.00 V out. 2. Match R59 and R60 to 1% or select values which give +15.00 V out. 3. Resistors are in Ohms, ¼ Watt, 20% tolerance, and capacitors are in microfarads, 20% tolerance, unless otherwise indicated.



NOTES
1. VALUES ARE IN UNITS OF OHMS FOR RESISTORS & MICROFARADS FOR CAPACITORS, UNLESS OTHERWISE SHOWN. TOLERANCE IS 20%, UNLESS OTHERWISE SHOWN

Fig. 5. Schematic of keyer.

with the three secondary windings connected in series. Capacitors C7 and C8 charge to the peak ac voltage, about ±25V above and below ground. The voltage regulator circuit uses a Motorola MC1469R regulator. The circuit was taken from the Motorola Microelectronics Handbook, Second Edition. Load current is about 42mA at +15V dc and 13mA at -15V dc. As described in the notes, R62 and R63 are first selected to provide -15V dc output, and then R59 and R60 are matched to produce +15V dc output. Additional rectifiers produce -8V across C9, and +8 across C10, unregulated. The ±8V powers the audio amplifier, U10. The +8V is dropped by regulator transistors Q26 and Q27, which give +3.6V for the logic.

A Wien bridge is used as a 400Hz sinewave sidetone oscillator. U11 is a type 741 operational amplifier with input from a conventional Wien bridge circuit. CR19 and CR20 limit the oscillation amplitude. R76 is a variable resistor, which should be adjusted for ±8V peak oscillation amplitude at the output of U11. If difficulty is experienced in getting a ±8V oscillation amplitude, R75 might have to be varied slightly, possibly as much as 1 or 2K either way. The output of the oscillator is fed to a keyer circuit. Keying is accomplished by Q24, which acts as an open or short circuit to ground. Output from the volume control, R79, is fed through R80 to the power amplifier, U10, which drives a 16Ω speaker. Approximate normal listening levels are ±0.5V peak ac on the speaker with ±0.06V peak ac at pin 1, U10.

The code speed potentiometer produces about a 3.1 to 1 range of code speeds. This gives about 8 to 25 words per minute with the 0.2 microfarad integrating capacitor. The other two integrating capacitors change a factor of two, so that the total speed range is about 4 to 50 words per minute.

Construction

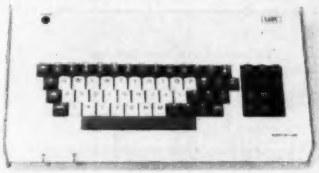
The keyer is housed in a cabinet made by L.M. Bender (L.M.B.), type W1C. Two etched circuit boards are used to provide the circuitry shown in Fig. 5 and 6. The boards accommodate all the smaller components – that is, all except the power transformer, large filter capacitors, panel switches, speaker, and panel controls. The two boards both are made to fit standard 22 pin card connectors, and are mounted one above the other to save cabinet space. The top-most card, Fig. 7, represents the circuitry shown in Fig. 5, and is the more complex. The bottom card, Fig. 8, is considerably simpler and represents the circuitry of Fig. 6.

The top card has all the digital ICs mounted on it plus the ZEL-1 hybrid IC op amp (U8). The digital ICs (U1 through U7) may be directly soldered into the board, or (as the authors prefer) 14 pin sockets may be used. The ZEL-1 (U8) was soldered into the board directly because the only socket available for this excellent op amp is huge and clumsy. There are a fairly large number of wire jumpers (insulated wire) on this board, because it is rather complex and only a single-sided board was used. However, the time to install the wire jumpers is small compared to the much more tedious task of laying out and etching a double-sided board. All but two of the transistors used on the top board are epoxy types made by Fairchild (and National Semiconductor). The two exceptions are also plastic-encapsulated types, but they are Darlington pairs: the 2N5307 (NPN Darlington) by G.E. and the MPS-A65 (PNP Darlington) by Motorola. All these transistors are soldered directly into the board.

The bottom card, on which is the circuitry of Fig. 6, has three ICs and eight transistors on it. Like the other card, the transistors are soldered directly into the board. However, in addition to six more of the inexpensive epoxy transistors, two metal can T05 types are used where greater dissipation is required in the voltage regulator section (2N3053's). U11 may be any of three different styles of the 741 type op amp, as manufactured by nearly every producer of linear ICs. The DIP (14 pins) and the "Half DIP" (8 pins) style of 741 will fit the board with or without the appropriate IC socket. The "T05" version of the 741 can be soldered in directly by spreading the leads slightly. U10 is soldered directly into the board, and has a heat dissipator clipped onto its T05 can. U9 is also directly soldered into the board, but mounted on .64cm (¼") metal spacers above the board. This way of

ANNOUNCING

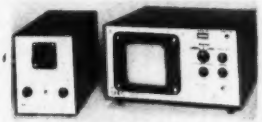
"THE ULTIMATE IN SSTV EQUIPMENT"



THE SEEC HCV-3KB SLOW SCAN TV KEYBOARD

Announcing another first from the company and the designer of the world famous HCV-1B SSTV Camera and the HCV-2A SSTV Monitor, now the HCV-3KB Slow Scan TV Keyboard. This is the first commercially made SSTV Keyboard and it is built with the same quality as all SEEC/THOMAS equipment. We will not attempt to list all the features of the HCV-3KB here and we suggest that you write for full specifications. For those that are not familiar with SSTV Keyboards, the HCV-3KB eliminates the need for a menu board or other number/letter set-up arrangements which is very time consuming to set-up a meaningful text by arranging letters one at a time, by hand on a board or other surface. It also "frees up" the SSTV camera for other uses, such as live shots of the operator or other subject matter. Simply type out the message you wish to send. U.S. Patent #DD-033469.

BASIC SPECIFICATIONS



*30 characters per SSTV frame. Six characters horizontally and 5 characters vertically. Special 35 characters per frame available.
*Meets all standard accepted SSTV specifications.
*Positive-Negative color (video) reversal.
*½ and ⅛ frame rates.
*4 shade gray scale generator.
*Dual Fast and Slow Scan rf and video outputs (special-optional).
*Plug-in printed circuit board-gold flashed edge connector.
*ICs, op amps, transistors in plug-in sockets.
*Built-in 115/230 V 60 Hz power supply.
*Special 16½" x 8½" x 3¾" aluminum cabinet — black and white or optional 2 tone gray or blue and white — specify.
*Special introductory cash with order price: $455.00. Regular price $495.00. Five ways to purchase: Cash, C.O.D. (20% deposit), Mastercharge, BankAmericard, SEEC Financing plan (up to 36 months). Note: All credit cards pay regular price of $525.00. All prices F.O.B. Hendersonville TN. Standard 1 year warranty.

HCV-1B SSTV Camera $452.00 (reg. $475.00).
HCV-1B SSTV Camera with ALC $492.00 (reg. $515.00).
HCV-2A SSTV Monitor with 2 CRT filters $398.00 (reg $425.00).
HCV-2B SSTV Monitor with built-in Fast Scan viewfinder $493.00 (reg. $520.00).
HCV-70FSVFK Fast Scan viewfinder modification kit for 70 and 70A. Monitors $69.95. Factory installation $37.50 additional.
Sony TC110A Cassette Recorder $134.95.
Heavy Duty Camera tripod $34.95.

A complete line of camera and monitor accessories are available — please write for current prices and delivery. Five ways to purchase: Cash With Order, C.O.D. (20% deposit), Mastercharge, BankAmericard, SEEC Financing Plan (up to 36 months). Note: All credit cards pay regular price shown. All prices are F.O.B. Hendersonville TN. Call or write us for complete specifications on any of our equipment or to be put on our mailing list. We have a 24 hour telephone answering service to better serve you, plus on the air technical assistance from the designer, WB4HCV (Jim). Two locations to better serve you. Our main plant at 138-B Nauta-Line Drive, and our lab at 218 Tyne Bay Drive, Hendersonville. Complete 80-2 meter operation from either location. Drop in to see us if you are ever near Nashville, Tennessee.

Sumner Electronics & Eng. Co. inc.

P.O. BOX 572
HENDERSONVILLE, TENNESSEE 37075
TELEPHONE: 615-824-3235

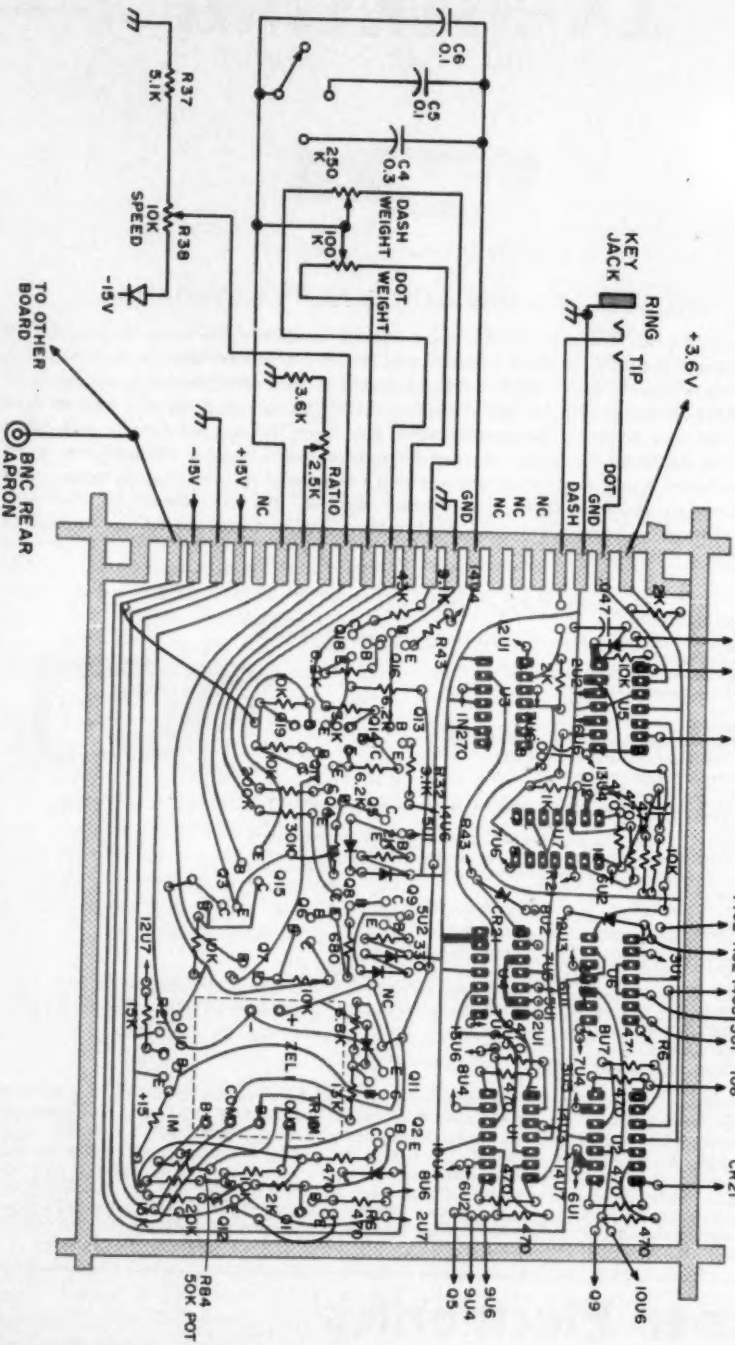


Fig. 7. Board layout of circuitry for Fig. 5.

assembly, HEP176.

CR18	1N4454	General Electric
CR19	"	"
CR20	"	"
CR21	1N270	Hughes
CR22	1N270	Hughes
U1	MC724P or HEP570	Motorola
U2	"	"
U3	"	"
U4	"	"
U5	"	"
U6	"	"
U7	"	"
U8	ZEL-1	Zeltec
U9	MC1469 or HEP-C6049R	"
U10	MC1454G or HEP593	"
U11	μA741	Circuit board will accept any D.I.P. or TO5 style as manufactured by Fairchild, National, Motorola, Signetics, etc. (μA741C, LM741C, MC1741C/HEP-C6052P, N5741, respectively).

Resistors are 20% tolerance, ¼ watt, values in ohms, except where otherwise noted.

R1	470 ohms.
R2	470 ohms
R3	470 ohms
R4	470
R5	2k
R6	470
R7	2k
R8	470
R9	10k, 1% tolerance
R10	10k, 1% tolerance
R11	6.2k
R12	2k
R13	680
R14	2.5k potentiometer, linear taper, 10% tolerance.
R15	3.6k, 5%
R16	30k, 5%
R17	200k, 5%
R18	330
R19	1 Megohm
R20	6.8 k, 5%
R21	15k
R22	10k
R23	47k
R24	10k
R25	1k
R26	470
R27	470
R28	20k
R29	15k, 5%
R30	10k, 5%
R31	13k, 5%
R32	9.1k
R33	250k potentiometer, linear taper, 10%.
R34	100k potentiometer, linear taper, 10%.
R35	43k, 5%
R36	30k, 5%
R37	5.1k, 5%
R38	10k, potentiometer, clockwise logarithmic taper, 10%.

GATEWAY ELECTRONICS

8123-25 PAGE BOULEVARD
ST. LOUIS, MISSOURI 63130
(314) 427-6116

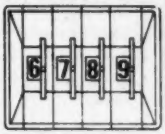
THUMBWHEEL SWITCHES

STANDARD SIZE - 0.5 x 2.125 x 1.78

10 position decimal	**$3.00**
10 position BCD & compl.	**$4.00**
End Plates (per pair)	**$1.45**

MINIATURE SIZE - 0.312 x 1.3 x 1.3

10 position decimal	$3.00
10 pos. BCD & comp.	$4.00
10 pos. BCD only	$2.75
End Plates (per pair)	$1.00
Divider Plates	$1.25
Blank Body	$ .30



All switches are black with white figures and snap-in front mounting.

11 MFD – 10kV dc capacitor – 19 x 13 x 5. Ship wt. 90 lbs. **$25.00**

4 MFD – 10kV dc capacitor – 9 x 8 x 4. Ship wt. 30 lbs. **$15.00**

7.5 MFD – 7.5kV dc capacitor – 12 x 8 x 5. Ship wt. 25 lbs. **$10.00**

GEARHEAD MOTOR – 8 rpm – 115V – 1/5 HP – 3/4" dia. shaft – new, 15 lbs. **$10.00**

MARCH SPECIALS

10 amp 200 prv bridge. Ship wt. 1 lb. $1.50

6146A tube (new). Ship wt. 1 lb. $3.75

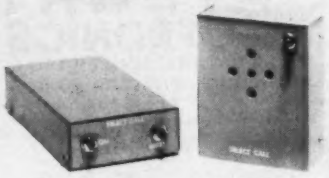
Two tubes for $6.00. Limit four tubes per customer.

GATEWAY ELECTRONICS of COLORADO

Announcing the opening of our new Denver Colorado store on or about March 1st. Location is 2839 W. 44th Avenue. Come in and see us for store opening specials and prizes.

$5.00 minimum order. Visit us when in St. Louis. Please include sufficient postage.

Select Call



DECODER ENCODER

TIRED OF LISTENING TO THE CHATTER ON THE CHANNEL? THEN USE SELECT CALL – RECEIVE ONLY THOSE CALLS MEANT FOR YOU!

WITH THE SELECT CALL SYSTEM YOUR RADIO REMAINS SILENT UNTIL SOMEONE SIGNALS YOU. EASY TO USE – EASY TO INSTALL – NO MODIFICATION REQUIRED TO YOUR EQUIPMENT.

DECODER (5-1/2" x 3" x 1-1/4")

- Easy hook-up. Connects between radio and speaker, 12 vdc
- No tuning, narrow bandwidth
- Switches out for normal operation
- Decoder can be set for Touchtone® II activation thus no need to buy encoder if Touchtone is available

ENCODER (3" x 3-1/2" x 1-1/4")

- Self contained
- Encoder acoustically coupled to microphone – no direct connection – hold mike near encoder speaker
- Requires no external supply
- Tone transmitted only once to activate decoder

Select Call signaling frequency easily changed without need for frequency counter. Select Call can be used with AM, FM, repeaters, intercom, telephone.

SELECT CALL DECODER KIT complete $29.50

Select Call decoder assembled and tested $38.50

Select Call encoder assembled and tested $11.95

Select Call encoder when purchased with decoder or decoder kit . . . . . $ 8.95

Specify system frequency (150 hz to 2500 hz). If not specified, units will be set at 1209 hz (a Touchtone frequency). Add $1.50 for postage and handling. California residents add 6% sales tax. No COD.

SASE for more info.

Egbert Electronics
17333 Tramonto Drive
Pacific Palisades, California 90272

*Touchtone is a Western Electric Trademark

ARNOLD'S ENGRAVING

Personalized

ELECTRIC
ON-THE-AIR
SIGN
WITH CALL

Works on
110 VAC
$12.95

Metaltex Lapel Bar - $1.50 Metaltex Tie Clip - $2.25

ARNOLD'S ENGRAVING
2041 Linden St. Ridgewood, N.Y. 11227

Star-kits G.P.O. Box 545 Staten Island, N.Y. 10314

We carry etched circuit boards for all the K2OAW projects - Counter... CW ID'er... Synthesizer... Repeater Control... Scaler... and now, the Brand New

DIGITAL SWR COMPUTER

Automatically computes and displays your SWR at all times - ideal for antenna adjustments or constant monitoring. Circuit board and full instructions only $16 postpaid (N.Y. orders add sales tax.)

Designed & Engineered by K2OAW

mounting U9 allows the IC leads to flex and thus better register with the board layout pads. It is quite important that the case connect electrically with the pad on the board nearest the card edge (via a metal machine screw, spacer, and nut), since the case of the IC is one of its terminals.

As can be seen in the photographs, the "plug" ends of the circuit boards are toward the front panel where they mate with the two 22 pin card plugs. This puts the various inputs and outputs of the two boards immediately adjacent to the front panel controls to which they connect. The rest of the construction is conventional, and anyone building the keyer will probably add his own variations in the exact layout.

... K6ZN & W6GXN

Parts List

Q1	2N3565	Fairchild or National
Q2	2N3641	Fairchild or National
Q3	2N5307	General Electric
Q4	2N4250	Fairchild or National
Q5	2N3565	Fairchild or National
Q6	2N3565	"
Q7	2N4250	"
Q8	2N4250	"
Q9	2N3565	"
Q10	2N4250	"
Q11	2N3565	"
Q12	2N3565	"
Q13	2N4250	"
Q14	2N3565	"
Q15	2N3565	"
Q16	2N4250	"
Q17	2N4250	"
Q18	2N3565	" "
Q19	MPS A65	Motorola
Q20	2N3565	Fairchild or National
Q21	2N4250	"
Q22	2N3053	R.C.A.
Q23	2N3641	Fairchild or National
Q24	2N3646	"
Q25	2N4250	"
Q26	2N3565	"
Q27	2N3053	R.C.A.
CR1	1N4454	General Electric
CR2	"	"
CR3	"	"
CR4	"	"
CR5	1N270	Hughes
CR6	1N4454	General Electric
CR7	"	"
CR8	"	"
CR9	"	"
CR10 thru CR17		Motorola integrated circuit

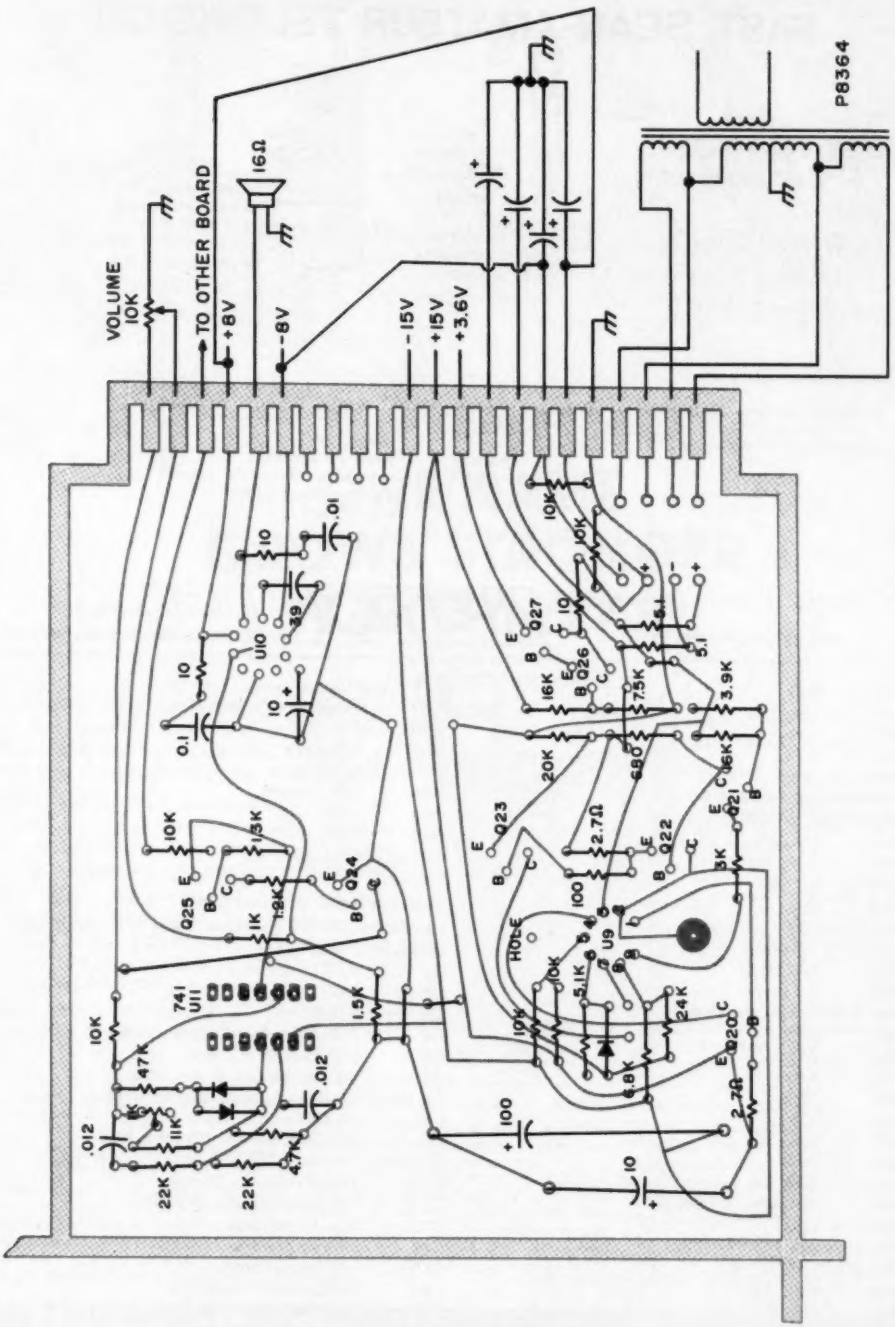
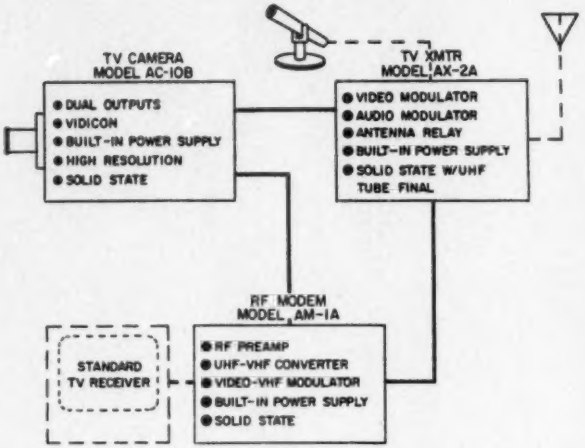


Fig. 8. Board layout of circuitry for Fig. 6.

FAST SCAN AMATEUR TELEVISION

NOW you can enjoy FSTV at reasonable cost.
NOW available—
a COMPLETE FSTV equipment line.*

* U.S. made with parts available from your local electronic parts distributor.

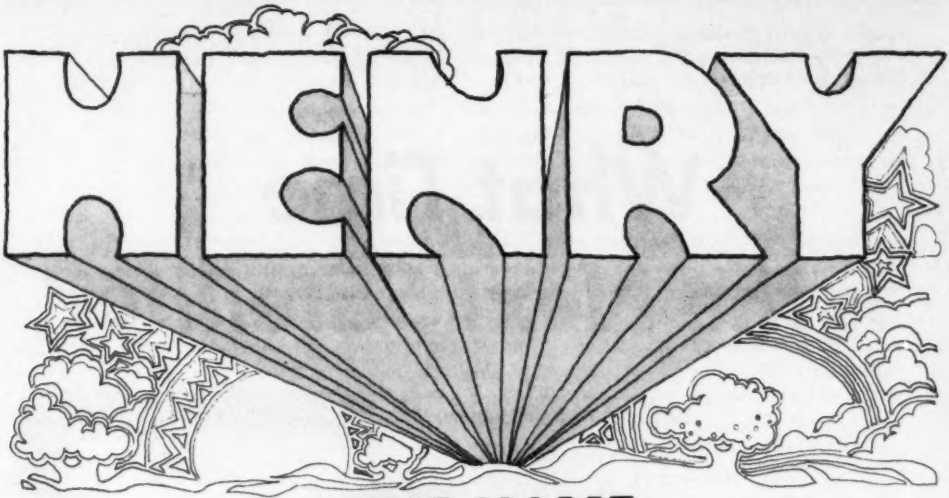


For detailed technical information and pricing—write to:

APTRON

Dept AMTV
P.O. Box 112A, R.R.2
Bloomington, Indiana, 47401

R39 6.2k
R40 R41 10k, 1%
R42 6.2k
R43 9.1k
R44 2k
R45 thru R48 470 ohms
R49 & R50, 5.1 ohms, ½ watt
R51 15k, 5%
R52 3.9k 5%
R53 3k, 5%
R54 680
R55 20k
R56 2.7 ohms
R57 100 ohms
R58 2.7 ohms
R59 & R60, 10k, matched to 1%
R61 5.1k
R62 24k
R63 6.8k
R64 1.3k
R65 10k
R66 16k, 5%
R67 1.2k
R68 7.5k, 5%
R69 10 ohms, ½ watt, 5%
R70 10k
R71 10k
R72 & R73 22k, 5%
R74 4.7k, 5%
R75 11k, 5%
R76 1k, screw driver adjustable.
R77 47k, 5%
R78 10k
R79 10k potentiometer, logarithmic clockwise
R80 1k
R81 1.5 ohms
R82 & R83, 10 ohms
R84 50k trimpot
R85 6.2k 10%
R86 100k, 20%
Cabinet Bud LMB-W1C.
Transo
Transformer Stancor P8364
Capacitors are 20% tolerance, value in microfarads, unless otherwise noted.
C1 0.047 microfarad
C2 0.001 "
C3 0.002 "
C4 0.33 microfarad, Mylar, 10%
C5 0.1 microfarad, Mylar, 10%
C6 0.1 microfarad, Mylar, 10%
C7, C8, 2200 microfarads, 40 volts Mallory CGS222U040BB1.
C9, C10, 3200 microfarads, 10 volts, Mallory CG322U1OA1 or HC1040A.
C11 10 microfarads, 25 volts.
C12 100 microfarads, 25 volts.
C13 0.1 microfarads.
C14 10 microfarads, 10 volts
C15 0.01 microfarads
C16 0.012 microfarads, 5%
C17 0.012 microfarads, 5%
C18 200 picofarad, 20%
C19 200 picofarad, 20%



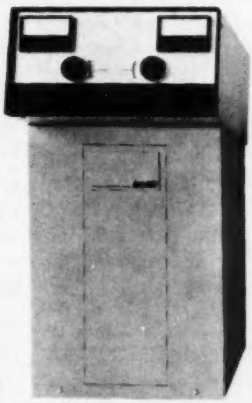
ONE NAME GROWS STRONGER YEAR BY YEAR

When you buy a Henry Linear Amplifier, you buy quality, performance, reliability.. all the features that have made Henry amplifiers world famous. But most of all you buy the integrity of the Henry name.

Other brands have disappeared from the amateur scene...names that were familiar to all amateurs. Now those companies are gone and their equipment is orphaned.

But one name has grown steadily throughout the years. Today Henry amplifiers stand preeminent throughout the entire amateur world...symbols of the finest equipment you can buy.

Join the great family of happy Henry amplifier owners. Treat yourself to the best.



2K-4...
THE "WORKHORSE"

The 2K-4 linear amplifier offers engineering, construction and features second to none, and at a price that makes it the best amplifier value ever offered to the amateur. Constructed with a ruggedness guaranteed to provide a long life of reliable service, its heavy duty components allow it to loaf along even at full legal power. If you want to put that strong clear signal on the air that you've probably heard from other 2K users, now is the time. Move up to the 2K-4. Floor console or desk model... $895.00

2K-ULTRA Small, rugged and reliable. Loafs along at full legal power without even the sound of a blower. Uses the best components available, including a pair of Eimac 8873 tubes. $895.00

TEMPO/2001 Small, reliable and inexpensive. Two Eimac 8874 grounded grid triodes, full kilowatt of output for SSB, built-in solid state power supply, antenna relay, internal blower, relative RF power indicator and full amateur band coverage from 80-10 meters. $595.00

3K-A Superior quality linear amplifier for commercial and military use. Two Eimac 3-500Z grounded grid triodes, three kilowatts PEP input on SSB with efficiencies in the range of 60%. PEP output in excess of 2000 watts. Provides a power supply capable of furnishing 2000 watts of continuous duty input for RTTY or CW with 1200 watts output. $1150.00

Henry offers a line of superb commercial high frequency amplifiers including the 4K-Ultra and 1K-4A Channelized Amplifier. Also solid-state Vhf and Uhf amplifiers up to 120 Watts.

Please call or write for full technical specifications. Henry Amplifiers are also available at select dealers throughout the U.S.
Export inquiries invited

Henry Radio

11240 W. Olympic Blvd., Los Angeles, Calif. 90064 213/477-6701
931 N. Euclid, Anaheim, Calif. 92801 714/772-9200
Butler, Missouri 64730 816/679-3127

Ralph E. Taggart WB8DQT
4515 Oakwood Drive
Okemos MI 48864

What Time is the Next Satellite?

An Electronic Timer for Satellite Tracking

For anyone engaged in satellite tracking, either with the OSCAR communications satellites or the numerous weather satellites presently in orbit, there is a constant need for data on the position of the satellite in its orbit. The usual practice for both OSCAR and weather satellites is to receive the W1AW bulletins and utilize the data to calculate acquisition times. Logging the daily bulletins can become somewhat of a chore if time is limited and the calculations required for either short or long term acquisition data are also time consuming, even with a calculator. Two authors in a recent issue of QST (McKim and Simpson) presented ingenious mechanical timing systems for display of OSCAR orbital data. Both of these systems require a fair amount of mechanical work and reprograming. Either for a new satellite requires a fair amount of effort in selection of the proper gear ratios and possible mechanical alterations. In the course of my own experiments in reception of NOAA weather satellite imagery, I developed a series of digital timing arrays to permit unattended reception and tracking of the weather satellites I was interested in. The heart of the system that finally evolved was an all electronic timing unit that provides a visual display of equatorial crossing data, indicating the elapsed time since the last equatorial crossing. Since many of the tracking techniques adopted by amateurs utilize such data (Direct Transmission System, Users Guide, etc.) the unit would be very useful for stations engaged in OSCAR communications experiments. The unit will run for a month or more without requiring

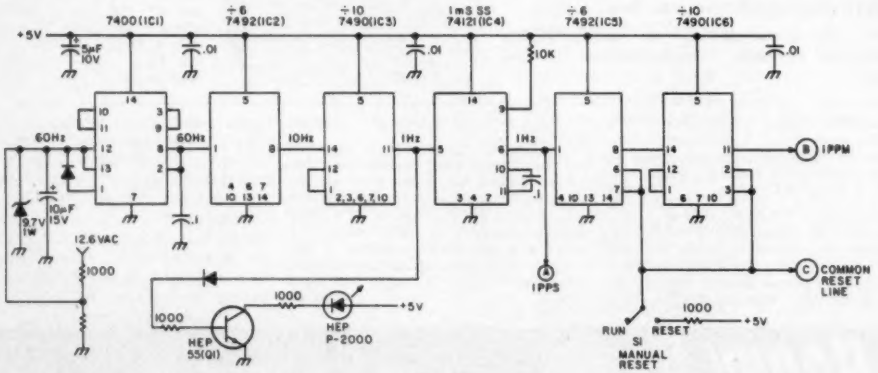
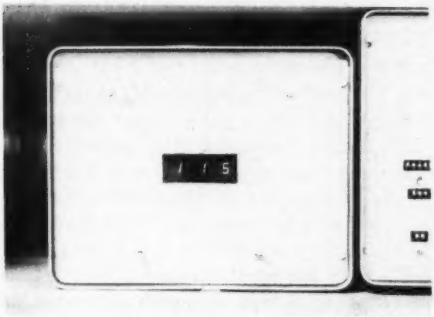


Fig. 1.

correction and reprograming for a new satellite orbital period requires less than five minutes and involves little more than changing four solder connections within the unit.

The satellite timing unit is nothing more than a glorified digital clock. Normal digital clocks count seconds, minutes and hours and rest the count to zero at the end of a 12 or 24 hour period. The satellite timer is essentially a clock that counts in seconds and resets at the end of each orbital period of the satellite. If the clock is started at any satellite equatorial crossing the unit begins



The author's satellite timer. The front window display indicates minutes since the last equatorial crossing. Since the timer is presently programed for a period of 116 minutes, 11 seconds, the 115 minutes displayed indicates that the satellite will shortly complete an orbit. The use of a red plastic filter behind the display windows allows the numbers to be viewed while blocking out details of the LEDs and circuit board. The toggle switch on the lower left is used to reset the timer two or three times a month to minimize accumulated errors. The switch on the lower right is a simple on/off power control.

displaying accumulated time and resets on the next crossing. The front panel display indicates the time in minutes since the previous crossing and can be used as the time base for tracking the satellite for any pass within range of the ground station.

Circuit Function

The timer unit has three principal subassemblies: A time base derived from the 60 Hz ac line to provide accurate 1 second and 1 minute pulses, an orbital timer board that provides an accurate reset of the display at the end of each orbital period, and a display board that provides the timing display on the front panel. TTL logic is used throughout and although a fairly large number of devices are used, they are available at very reasonable cost from a large number of surplus outlets.

The time base board, Fig. 1, consists of six integrated circuits. IC1 is a quad 2 input NAND gate which shapes the 60 Hz ac from the power supply transformer to provide 60 Hz square waves for the counters. IC2 and IC3 comprise a divide by 60 chain that provides square wave output pulses at a one pulse/second rate. These square waves drive a transistor (Q1) which switches a LED on and off at the one second rate. This LED doubles as a pilot lamp and also indicates the proper function of the early sections of the time base circuit. The output of IC3 is also routed to IC4, a single shot multivibrator which provides short pulses (1 ms) at the one second rate for the orbital timer board. IC3 is followed by IC5 and 6 which divide the 1 Hz square wave by 60 to develop a one pulse/minute square wave that drives the display board. The reset line of these two ICs is connected to a common reset bus for the entire unit. The reset bus is activated automatically by the orbital timer and resets the visual display. A manual reset switch (S1) is also provided on the reset line to start the timer at an equatorial crossing.

The orbital timer board, Fig. 2, counts seconds and resets all of the circuits when the proper total is reached for the satellite in question. The timer uses four decade counters (IC7-10) which can accumulate a total count of up to 9,999 seconds (slightly over 166 minutes), more than sufficient for any conceivable orbital configuration of OSCAR or weather satellites. Each of the ICs, storing counts of units, tens, hundreds, or thousands of seconds, is connected to a 7441 IC which functions as a binary coded decimal (BCD) to decimal decoder. Such decoders develop a low on the appropriate decimal output when a given BCD count appears in the decade counter. The reset function of the counter is based on detecting the presence of the desired total count at the decimal outputs of the 7441s and generating

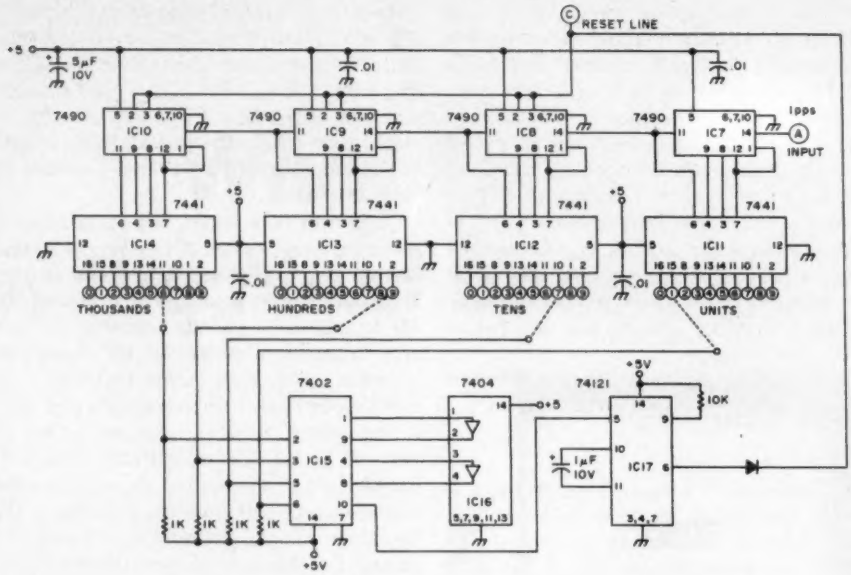


Fig. 2.

the proper reset signal when the count has been reached. NOR gates are used to provide this function. A NOR gate will have its output go high only when all its outputs have gone low. IC15 is a quad 2 input NOR gate, meaning that it contains 4 NOR gates, each with 2 inputs.

Programing the timer involves connection of the proper decimal outputs of the 7441s to two of the gates in this package. NOAA 3, with an orbital period of 116 minutes 11 seconds, will be used as an example. This orbital period represents a total of 6971 seconds and when this count has accumulated we want the counter to reset. Fig. 3 shows the logic diagram of the sensing and reset circuits. The inputs of the two ICs are held high by resistors connected to the positive supply. When the counters are all at zero the selected outputs of the decimal converter (6-thousands, 9-hundreds, 7-tens, 1-units) are all high and the outputs of both NOR gates are therefore low. As the count reaches 6000 the 6 output of the "thousands" decimal converter goes low, taking one input of gate 1 low. The output of gate 1 is still low, however, since a NOR gate requires all inputs to be low if the output is to go high. When the count reaches 6900 both the inputs to gate 1 are low and its output goes high. This high is inverted by one section of a hex inverter (IC16) thus becoming a low which is applied to one input of gate 3. At this point however, both inputs of gate 2 are still high and its output is therefore low. This low inverted by another inverter becomes a high applied to the other input of gate 3, thus keeping the output of gate 3 low. When the count reaches 6970 one input of gate 2 will pull low but the gate's output will remain low. When the count reaches 6971 both inputs of gate 2 are low and its output goes high. The inverted output of gate 2 lowers the remain-

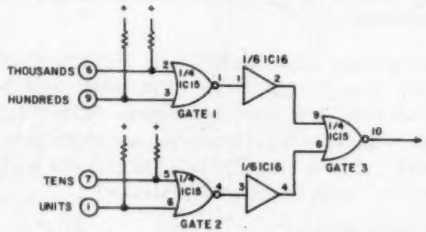


Fig. 3. Details of the orbital timer reset circuit. The output of gate 3 goes high only when the thousands, hundreds, tens and units inputs to gate 1 and 2 go low at the end of the programmed orbital period.

ing input of gate 3 which then goes high at the output. Thus, the only time the output of gate 3 will be high is when a count of 6971 is stored in the decade counters and decimal decoders. This high could be used directly to reset all of the counters in the unit but improper reset would be likely since there are so many counters involved. The high at gate 3 of IC15 is thus used to trigger a 10 ms single shot (IC17). The 10 ms output of the multivibrator is sufficiently long to assure that all of the counters in the unit will reset. The programing used in this example is indicated by dotted lines in the schematic. Other orbital periods can be accomodated by changing the connections between IC15 and the appropriate outputs of IC11-14. One second was chosen as the basic time base because it provides reasonable accuracy with moderate circuit complexity. The orbital programing should be chosen on the basis of the nearest whole second. A worst case situation thus involves a maximum error of 0.5 seconds per orbit. Under such conditions the timer would run approximately six seconds slow or fast each day, assuming 12 orbits per day. The counter would be one minute off every ten days. The closer the true orbital period to a whole second, the greater the accuracy. In the worst case shown above, assuming one minute as the maximum allowable error, the counter could be reset a minute early every ten days if running slow or the count keyed out of the counter for one minute if it were running fast.

The display circuit, Fig. 4, consists of three decade counters (IC18-20) driven by the one pulse per minute output of the time base. Each decade is connected to a BCD/7 segment decoder (IC21-23) which drives a seven segment LED numeric display. A reset pulse from the orbital timer resets the display to 000. Once each minute the display will be updated. In the case of the NOAA 3 orbit used as an example, the display would accumulate to 116. Eleven seconds after the initial display of 116 the display would reset to 000 and a new orbit begins.

Construction

Although the final unit can be packaged in any way desired, it simplifies construction and trouble-shooting if each of the three subassemblies are constructed on separate boards. Glass perf board with .1" hole spacing is ideal for this purpose. IC sockets are highly recommended even though they do increase the cost of the project. Normal digital construction practices should be followed. Bare #18 tinned wire may be used for the 5 V, ground, and reset busses with smaller wires used to interconnect ICs and routings to each bus. Do not scrimp on the bypass capacitors indicated, otherwise the

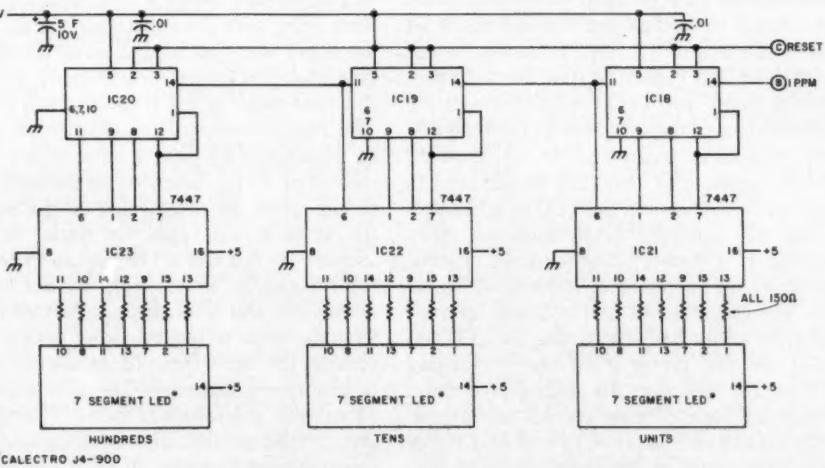


Fig. 4. LED display – minutes since equatorial crossing.

counter will react unfavorably when the transmitter, clothes dryer, or any one of the many possible rf and noise sources in the house are used. The 5 V line from each board should be returned to the common 5 V point on the power supply (Fig. 5) and the same thing for ground lines. Do not ground each board to the chassis! It is recommended that each board be built and tested on the bench using test leads. Once it is determined that each is functioning, they can then be wired into the complete unit with confidence. Begin by constructing the power supply, followed by the base board. With the time base board connected to the 12.6 V ac and the 5 V and ground lines the small indicator LED should flash on and off at a 1 second rate. A voltmeter on the output of IC6 should show a logic high (2.4 V min.) every minute. Note the time when the output goes high, disregard when it drops and note when it rises again — the interval should be 60 seconds.

The next board constructed should be the display. The LED display units mount on 14 pin DIP sockets. By proper positioning of the LED sockets the board can be mounted behind the front panel with a cutout for the LEDs. If you go this route be sure the hundreds indicator is on the left, the tens in the middle, and the units indicator on the right as viewed from the panel. It sounds simple but you will feel very foolish if you have to read your numbers backwards! When the board is finished and checked install all the LEDs and IC 18 and 21. Connect a test lead from the 1pps output of the time base to the input (pin 14) of IC18. Connect the reset circuit of the time base to the reset line of the display board and set S1 to reset. Apply power and the LED should read 0. Switch S1 to run and the LED should count from 0-9 with the count updating every second. If it counts out of sequence or some numbers are incomplete, recheck wiring. If the wiring seems OK and you still have an aberrant count try substituting the LED and IC21. Be sure power is off before changing ICs at any point in the testing procedure. When the first counter checks out remove IC21 and 18 and put in IC19 and 22. Change the 1pps input to the input of IC19 and repeat the entire test procedure. Remove 19 and 22 and insert 20 and 23. Repeat the entire test sequence with the 1pps test lead routed to the input of IC20. When all three display decades have been checked, replace all ICs, route the 1pps input to the input of IC18. Place S1 in reset and apply power. The display should read 000. Return S1 to run and you should observe a nice orderly count. At the end of 1 minute it should read 060, at the end of two minutes it should be 120, etc. As a final test set S1 to reset and connect the test lead from the input of IC18

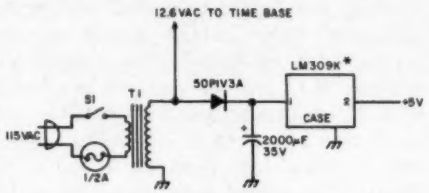
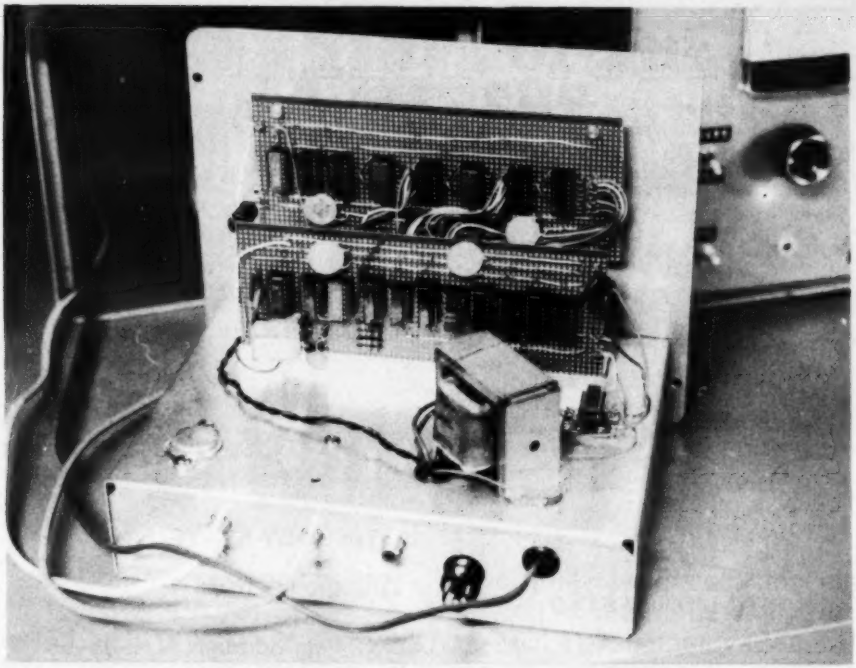


*Fig. 5. T1-12.6 V 2A., S1, SPST, power. *Regulator IC should be mounted on a good heat sink using mounting grease: All polarized capacitors are electrolytics. All decimal capacitors are low voltage disc ceramic units. All resistors ¼ or ½ W, 10%. Unmarked diodes are general purpose silicon (IN457, IN914, etc.).*

to the 1ppm output of the time base. Return S1 to run and the count should now occur at the one minute rather than one second rate.

Construction of the orbital timer is the final step. When it is finished it should be interconnected to the 5 V, ground, and reset lines along with the other two boards. Since we don't want to wait around all day to determine if it is operating properly, connect the 1pps input of the timer to pin 8 of IC1. This has the effect of speeding up the count by a factor of 60 (60 Hz input to the timer instead of 1 Hz). When wiring the timer you should select the programing on the basis of the satellite you plan to track. At our speeded up test rate a 116 minute 11 second orbit (used as an example in our earlier discussion) will now occur in just over 116 seconds. While testing the timer, temporarily connect the 1ppm input of the display board to the 1ppms output of the time base. Set S1 to reset and return it to run. The display should start at 000 and advance one unit every second. At the speeded up rate it should reset almost immediately after it



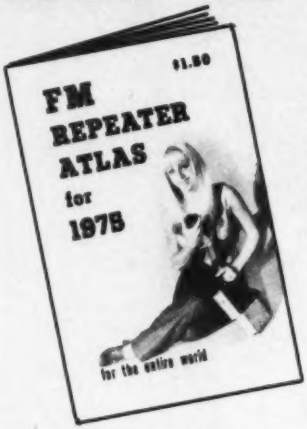
An interior view of the satellite timer. In this version a portion of the time base (the 1 minute count down chain) has been incorporated as part of the display board mounted up against the front panel. The time base ICs, the display 7490s and the decoders are visible while the 7 segment LEDs are on the other side of the board facing the panel cutout. The orbital timer and reset circuits are on the chassis mounted board. The 1 Hz monostable is mounted on a small sub-assembly behind the power transformer. The 60 Hz to 1 Hz timebase circuitry is mounted on a small board beneath the chassis. The cables plugged into the rear apron carry control signals from the orbital timer to automatic control units in the weather satellite station.

reaches 116 (in the case of our example). If it resets at some other value you should double-check your program wiring, if it fails to reset double check the wiring. If all appears well you should follow the signal through the count chain checking for proper logic levels at each point. This is the fastest way to uncover a bad IC – virtually the only thing that can keep a properly wired unit from operating. Once all boards are working you can mount and wire them into the completed unit.

Putting the unit into service involves calculating the nearest convenient equatorial crossing time for the satellite of interest. Set S1 to reset and at the calculated equatorial crossing time return it to run. Spot check the timer for the first few weeks to get an idea of how quickly it is drifting either fast or slow to get an idea of how often you will want to reset it. You will find that calculating one or two crossings a month is much easier than amassing the data every day. Since both weather satellites and OSCAR satellites are in sun synchronous orbits, the time of equatorial crossing can be neatly related to the point that the satellite crosses the equator. Listening to one or two bulletins will provide the raw data you need to convert time of crossing to the point of crossing and a graph can be prepared. With the crossing time available from the timer the graph can be used to orient the satellite track on the plotting board and you are ready to track using the timer as your time base.

JUST RELEASED!

1975 fm repeater atlas



73's all new REPEATER ATLAS is a must for every ham on 2 meters. There are 2,500 repeaters around the world (2,000 of them in the U.S.), and this atlas lists them all! Just off the presses, the 1975 edition is the most up-to-date listing you can buy. And monthly repeater updates in the 73 newspages makes sure that it stays that way!

As part of our continuing fight against inflation, we've held the price down to 1974 levels. You can still purchase this invaluable tool for JUST $1.50. Isn't it nice to know that there are a few places left where your dollar is still worth something?

LISTINGS BY STATE

ORDER TODAY!

STILL ONLY $1.50

73 MAGAZINE Peterborough, N.H. 03458

For FREQ. STABILITY

Depend on JAN Crystals. Our large stock of quartz crystal materials and components assures Fast Delivery from us.

CRYSTAL SPECIALS

2-METER FM for most Transceivers 144-148 MHz — .0025 Tol.	ea. $3.75
Frequency Standards	
100 KHz (HC 13/U)	4.50
1000 KHz (HC 6/U)	4.50
Almost all CB Sets, Tr. or Rec. (CB Synthesizer Crystal on request)	2.50
Any Amateur Band in FT-243	1.50

(80-meter, $3.00 — 160-meter not avail.) 4/$5.00

For 1st class mail, add 20c per crystal. For Airmail, add 25c. Send check or money order. No dealers, please.

JAN CRYSTALS

Division of Bob Whan & Son Electronics, Inc
2400 Crystal Drive
Ft. Myers Florida
33901
All Phones
(813) 936-2397

Send 10c for new catalog with 12 oscillator circuits and lists of frequencies in stock

If there is sufficient interest, it would be possible to prepare a short article on tracking techniques – let 73 know if you would like to see such an article. A future article in this series will show some of the automated weather satellite equipment that can be interfaced with the timer. This will include turning on the recorder at preset points in the satellite orbit during the daily "windows" and automated antenna tracking. With this sort of equipment the satellite station can operate while you are away at work or even a month's vacation and the pictures will be waiting when you return.

. . .WB8DQT

References

McKim, J.E. 1974. Instant Oscar 6 locator. QST, May: 11-12.

Simpson, A.A. 1974. A satellite timing mechanism. QST, May: 13-14, 22.

Direct Transmission System Users Guide. 1969. National Environmental Satellite Service, U.S. Dept. of Commerce. Available from Supt. of Documents, U.S. Government Printing Office. $2.25.

MEET THE STATE OF THE ART ON 2 METERS... THE ITC MULTI-2000 CW/SSB/FM TRANSCEIVER

Whether your interest is simplex, repeater, DX or OSCAR the new ITC MULTI-2000 lets you get into all the action on all of the band. Fully solid-state and employing modular construction, the MULTI-2000 enjoys features found in no other 2m transceiver.

FEATURES

- PLL synthesizer covers 144-148 MHz in 10 kHz steps
- Separate VXO and RIT for full between-channel tuning
- Simplex or ± 600 kHz offset for repeater operation
- Three selectable priority channels
- Multi-mode operation (CW/SSB/NBFM/WBFM)
- Built-in AC and DC power supplies, noise-blanker squelch and rf gain control
- Selectable 1W or 10W output
- Separate S-/power and frequency deviation meters
- Built-in test (call) tone and touch-tone provision
- Excellent sensitivity (.3 μV for 12 dB SINAD)
- Superior immunity to crossmodulation and intermodulation
- Introductory price: $695.

THE ITC MULTI-2000 TRANSCEIVER...
PERFORMANCE THAT CHALLENGES YOUR IMAGINATION

INTERNATIONAL TELECOMMUNICATIONS CORP.
P.O. BOX 4235, TORRANCE, CALIF. 90510 • (213) 375-9879

Gary L. Tater W3HUC
7925 Nottingham Way
Ellicott City MD 21043

CQ OSCAR 7

An Introduction to OSCAR Satellite Operation

Four minutes to acquisition of signal. Three minutes, two minutes, one minute. Are these the sounds of a NASA satellite control room? Not necessarily. They just might be the thoughts of a radio amateur as he sits at his operating position waiting for the next OSCAR satellite pass.

If you have receiving equipment for 80-10 meters and haven't listened for OSCAR 6 as yet, you are missing one of the new and exciting facets of amateur radio. This article describes how you can get started, equipment requirements, frequencies and when to listen.

Basically, AMSAT-OSCAR 6 is a linear translator in a 910 mile polar orbit that retransmits the CW and SSB signals it picks up in the band 145.900 to 146.000 MHz down to the 29.450 to 29.550 MHz band. The 910 mile orbit gives this repeater in space a range of communication of about five thousand miles. Truly amazing when you consider the ten meter transmitter runs less than a watt.

AMSAT-OSCAR 7, launched November 15, 1974, is very similar to OSCAR 6 with the addition of a linear translator with a receiver on 432 MHz and a transmitter on 144 MHz. The exact frequencies for both satellites are listed in Table 1. As you can see, OSCAR 7 has several more translators and beacons than OSCAR 6. To accomodate the translators, command and control modules and batteries, OSCAR 7 is larger than its predecessor. OSCAR 7 is 17 inches high and has an octahedral crossection of 14 inches. The photograph of Jan King W3GEY and AMSAT-OSCAR-B (OSCAR 7) should give you a good idea of how small a satellite can be. Specific details on the capabilities of OSCAR 7 can be found in the references at the end of this article.

Getting Started

The best way to get started in satellite communications is to listen to several satellite passes. Most any receiver capable of

Jan King W3GEY (Project Manager) and Marie Marr (AMSAT's aerospace technician) pose with the AMSAT-OSCAR-B satellite.

receiving 29.45 to 29.55 MHz is fine to begin with. To insure your receiver is at its best, you should consider peaking the rf amplifier for reception at 29.5 MHz. The crystal calibrator is a handy signal source for

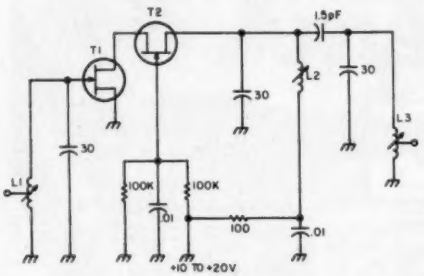


Fig. 1. A simple 10m preamp. T1, T2 MPF 102, MPF 106, 2N4416 L1, L2, L3 Identical 1.2 uH, 11 turns #26 enameled wire on 3/16" slug tuned form. Tap Li, L3 at 3 turns.

this operation. Additionally, for serious satellite work, you'll probably need a good ten meter preamp.

Fig. 1 shows a simple preamp useful on 10 or 2 meters, with appropriate coils, of course. Although this design uses two FETs, it needs no neutralization, which is handy. It can be constructed in a mini-box or on a small printed circuit card and placed in your receiver. Any ten meter signal can be used to tune it up.

The preamp will insure that you can hear both sides of each QSO in progress on the satellite when you listen in. This is an excellent test of your receiving set up.

On ten meters I use three antennas, but to start out, any low band antenna will do. When the satellite is low on the horizon I use a 3 element 10 meter beam. For overhead passes I switch to a 10 meter dipole or ten meter vertical. The switch is a wafer type in a mini-box. The vertical has no radials to improve the high angle radiation.

Another test for your receiver is that when OSCAR 6 is in range, you should be able to hear considerable noise in your receiver passband. This is the retransmitted noise from the satellite's receiver.

After listening to several passes, you'll probably want to make some contacts using OSCAR 6. To work through the two to ten meter repeaters of both satellites, one hundred W effective radiated power is recommended. A Johnson 6N2 or Ameco TX-62 at fifty W with 100 feet of RG-8 and a four element beam is one acceptable approach. Good results have been achieved with keying a 10 W 2 meter FM rig on CW and an eleven element beam. Although some satellite users have both azimuth and elevation control, a simpler but very effective compromise is to elevate the VHF antennas by 30 degrees. The antennas I use are shown in Fig. 2.

Operation

To make contacts you'll need to hear your two meter signal as it is retransmitted down to your ten meter receiver. The normal procedure is to send a series of dahs while tuning your receiver until you find yourself. Now you can compare your signal against the other signals in the passband and adjust your power input accordingly. Remember all of the signals in the output of the satellite are sharing the one W in proportion to their strength at the satellite's

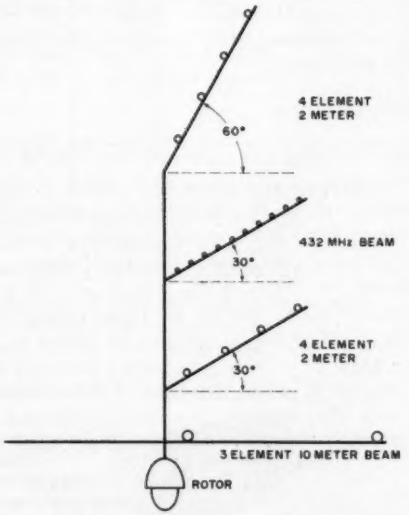


Fig. 2. OSCAR 6 and OSCAR 7 antennas at W3HUC.

receiver. Excessive power by one user may overload the satellite's AGC and reduce the strength of other user's signals, thereby causing interference and possibly disrupting QSOs in progress. The FCC has interpreted overloading the satellite as a violation of section 97.67 (b) of the Rules. By monitor-

Fred W2GN displays his compact mobile OSCAR satellite station.

ing your return signal, you can easily avoid such problems.

When To Listen

Determining when OSCAR 6 or OSCAR 7 is in range of your location is much easier than you think. In fact, after a few nights of listening to OSCAR you'll probably be able to calculate the passes for the following evening in your head. Oscar 7 has a similar orbit to OSCAR 6. Thus, what you learn for OSCAR 6 will also be useful for OSCAR 7.

OSCAR 6 orbits the earth at an altitude of 910 miles and when it crosses the equator heading north (ascending node), it makes an angle of 101.77 with the equator. The first ascending node orbit after 0000Z has been designated the reference orbit. The time the satellite crosses the equator, point A in Fig. 3, on each day's reference orbit is published in the *73 Magazine* AMSAT News Column and in the *AMSAT Newsletter*, or from AMSAT by sending a self addressed stamped envelope to: AMSAT, P.O. Box 27, Washington, D.C., 20044 for two months orbital data.

The reference orbit information consists primarily of an equator crossing time and degrees west of Greenwich the equator

Table 1
OSCAR 6 and OSCAR 7 input, output, beacon and station receiver requirements

	UPLINK (MHz)	DOWNLINK (MHz)	RECEIVER (28 MHz i-f)
OSCAR 6	145.9-146.0	29.450-29.550	29.450-29.550
BEACON		29.450	29.450
OSCAR 7	145.850-145.950	29.40-29.50	29.40-29.50
	432.125-432.175	145.975-145.925	29.975-29.925
BEACONS		29.5	29.50
		145.98	29.98
		435.1	31.1
		2304.1	

The Inside Story on Amateur *Slow Scan* TV

PART 1

SEND FOR OUR 7 PC. 10,000 WORD SSTV STORY. Everything from SSTV frequency allocations to reprints of ham magazine SSTV articles that you may have missed.

PART 2

WE'LL SEND YOU OUR DIRECTORY OF SSTV OPERATORS!

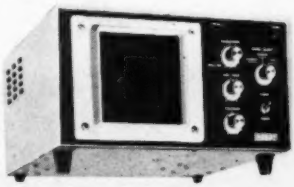
Talk with them yourself and see how much they enjoy SSTV. You might find that old friend you used to work on 6 meters has gone to SSTV.

PART 3

TUNE TO 14.230 mHz AND SEE ALL THE SSTV ACTION

There is almost continuous SSTV activity on 14.230. A good way to get the inside SSTV story is to monitor this frequency.

PART 4



WE'LL SHIP YOU OUR MONITOR AND/OR CAMERA ON OUR 100% SATISFACTION OR MONEY BACK GUARANTEE

See for yourself why SSTV is the fastest growing amateur radio activity.

MODEL 70A SSTV MONITOR $345
MODEL 80A SSTV CAMERA $345
MODEL 61 VIEWFINDER $265

Please send me the following:

☐ Free 7 pc SSTV literature ☐ Model 70A SSTV monitor ☐ Model 80A SSTV camera ☐ Model 61 Viewfinder

NAME _____ CALL _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

ORDER FACTORY DIRECT TODAY

ROBOT

ROBOT RESEARCH INC.
7591 Convoy Court
San Diego, CA 92111
Ph. (714) 279-9430

crossing will take place. As an example, the information below for orbit 9121 shows that

REV	DATE	GMT	LONGITUDE W.
9121	14 OCT 74	0135	72.1°

OSCAR 6 crossed the equator at 9:35 PM EDT at 72.1° west longitude on Sunday evening, October 13, 1974. From experience, I knew that at about 9:40 PM on this date I would begin to hear stations south of me in QSO via the satellite.

Once you know the pertinent information for a reference orbit, it is easy to determine the remaining orbits for that day and, in fact, for the rest of OSCAR 6's life. Since the satellite's period is 144.99455 minutes, all that you need do is add one hour and fifty-five minutes to the reference orbit equator crossing to get the second crossing of the day.

To determine where the satellite will cross the equator simply add 28.7° to the first equator crossing as shown below.

REV	DATE	GMT	LONGITUDE W.
9122	14 OCT 74	0330	100.8°

This is easily explained since the earth is spinning under OSCAR 6. During the time it takes OSCAR 6 to return to the beginning of its orbit, the earth has moved 28.7° to

$$\frac{114.9455}{24 \times 60} \quad 360^\circ \quad = 28.7487^\circ$$

the east. Thus, the satellite appears to have moved to the west.

In addition to the ascending node orbits which occur in the evening, there are also descending node orbits which occur during the morning hours. By using simple calculations, you can determine the time required for the satellite to travel from its equator crossing on the other side of the earth to a point where you can access it. The example in Fig. 4 places the satellite on the equator at 260.9° west longitude at 14:11Z. At approximately 14:40Z the satellite will reach its most northern point and begin its southward journey over North America reaching the equator at 15:09Z. These times can be determined by adding one quarter and one half of an orbit period, respectively, to the time of the start of the orbit.

$$\frac{114.994}{4} = 28.748 \text{ min.}$$

$$\frac{114.994}{2} = 57.497 \text{ min.}$$

The satellite will cross the equator at 95.3° west longitude, as determined from the following equation:

$$260.9^\circ - 180^\circ + 14.37 \approx 95.3^\circ$$

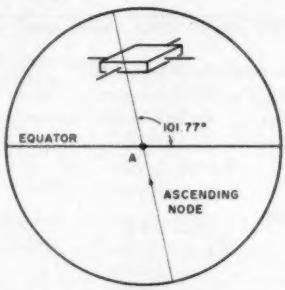


Fig. 3. Ascending node (northbound) equator crossing.

Table 2
AMSAT nets provide information to new satellite users

FREQUENCY	AREA	TIME	NET CONTROL
3850 LSB	No. America East	Monday 9PM EDT (0100Z Tues)	W3ZM
3850 LSB	No. America West	Monday 7PM PDT (0200Z Tues)	W6OAL
14280 USB	International	Sunday 1800Z	W3ZM
21280 USB	International	Sunday 1900Z	W3ZM
3780 LSB	Western Europe	Sunday 0915Z	G3IOR
3560 LSB	JA Net	Monday 1300Z	JA1ANG
14320 USB	SE Asia	Thursday 1300Z	JA1ANG
3850 LSB	ZL Net	Mon., Thur., Sat. 7PM NZT	ZL1WB

$$\frac{28.7487}{2} = 14.37^\circ$$

To complete this example, assume your location is approximately 90° west longitude and latitude such that you normally hear the satellite five minutes after an ascending node equator crossing. Therefore, for a near overhead pass, as in this example, you should begin to hear the satellite twenty five minutes before it reaches the equator. For the next twenty minutes until 15:04Z you should be able to access the satellite. Obviously, if you are significantly east or west of this location for this particular pass, the access window would be much shorter than twenty minutes.

Listed in Table 2 are the AMSAT nets where specific questions you may have will be answered for you. The nets provide up to date information for both newcomers and regular users on such items as the status of OSCAR 6, launch date for OSCAR 7, etc. For example, at the time this article was written, OSCAR 6 was turned on at 0000Z for twenty-four hours on the following GMT days: Mondays, Thursdays and Saturdays. During the summer, descending node (southbound) passes for OSCAR 6 were turned on for Sunday mornings. During the school

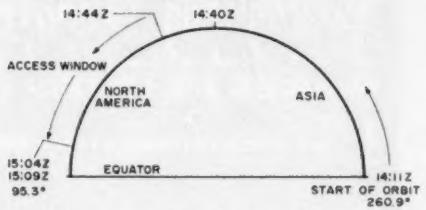


Fig. 4. Calculation of descending node access window.

year, Tuesday and Friday morning passes are turned on for use as an educational tool. If the satellite's battery voltage is sufficient, both the weekday and weekend descending node orbits will be available. OSCAR 7 has been designed with a positive power budget and should be available for more orbits than OSCAR 6. The AMSAT nets will still provide current information on special events for satellite users.

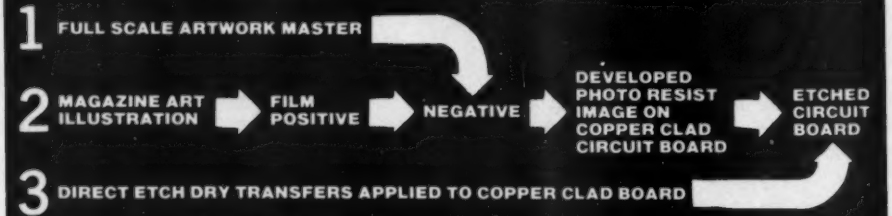
Experiments

There are many simple experiments that can be accomplished using OSCAR 6 and 7. For example, an OSCAR amateur station and a frequency counter can be used to demonstrate that the moving satellite causes a Doppler shift on the downlink signals of plus/minus 5.7 kHz on the ten meter signals

OSCAR 6 QSL card that you can receive by sending a report to AMSAT that includes normal QSL information on stations you hear using the satellite.

PHOTO ETCH PRINTED CIRCUIT KIT

MAKES PRINTED CIRCUITS THREE WAYS!


1 FULL SCALE ARTWORK MASTER
2 MAGAZINE ART ILLUSTRATION
FILM POSITIVE
NEGATIVE
DEVELOPED PHOTO RESIST IMAGE ON COPPER CLAD CIRCUIT BOARD
ETCHED CIRCUIT BOARD
3 DIRECT ETCH DRY TRANSFERS APPLIED TO COPPER CLAD BOARD

NO CAMERA
DARKROOM
FILM CUTTING
TRACING

USES DATAK'S POS-NEG PROCESS
The revolutionary photographic way that makes PERFECT printed circuits from original art or a printed page.

KIT CONTAINS: 5" x 6" steel printing frame. 4 sheets 5" x 6" photocopy film. yellow filter. chemicals for 1 pint film developer and 1 pint film fixer. 5" x 6" copper clad board. 3" x 4½" copper clad board. spray can of photo etch resist. 1 pint resist developer. 2 sheets 8½" x 11" layout film. 1 roll 1/16" printed circuit tape. 1 roll 1/32" printed circuit tape. 8 sheets dry transfer direct etch PC patterns including pads. transistors. round can and flat pack ICs. DIP ICs. edge card connectors. lines. circles. jogs. etc.. ¼ lb anhydrous ferric chloride to make 1 pint etchant. instructions.

ER-4 COMPLETE PHOTO ETCH SET . . . . . postpaid $24.95
AT YOUR DISTRIBUTOR OR DIRECT (N. J. residents add sales tax)

The DATAK corp. • 65 71st St. • Guttenberg, N. J. 07093

An easier experiment is to determine the minimum ERP which still allows you to hear your own signal. There are many fascinating experiments that are possible from copying the CW telemetry, such as determining the spin rate of the satellite.

Results

Results on OSCAR 6 have been phenomenal. Well over 2400 amateurs have made over 100,000 two way contacts. This is a tremendous growth rate from the previous two satellites designed for two way communications, OSCAR 3 and 4. There were 98 successful users on OSCAR 3 and 11 users for OSCAR 4. Short lifetime was the primary reason for the limited use of these satellites; however, the experience gained by both the users and developers contributed to the success of OSCAR 6.

The list of countries you can work through OSCAR continues to grow. The last count shows that stations from 87 countries have made contacts through OSCAR 6. Prior to the launch of OSCAR 7, the number of stations who had attained the goal of worked all states had risen to sixteen.

In conclusion, whether you wish to write a special computer program for satellite use or study propagation from satellites for a high school project, the only limit is your imagination. If you are a DXer, then working out to the fringes of the satellite's capability for new countries may appeal to you. Whatever your amateur radio interests are, this is the time to apply them to satellite communications and discover both the enjoyment and challenge of this new frontier in amateur radio.

REFERENCES

ARRL, Member's Guide to Amateur Satellites, Newington, Conn., 1973. 32 pages. Free to ARRL members upon request.

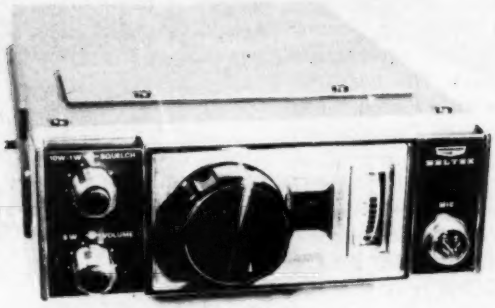
Kasser and King, "OSCAR 7 and its Capabilities," *QST,* February 1974, P. 56.

Soifer, "Getting Started in Satellite Communications," *AMSAT Newsletter,* June 1974, p. 25.

. . .W3HUC

ANNOUNCING

BELTEK W 5570



THE NEWEST TWO METER RIG SPECS ABOVE AVERAGE
USES TR 22 XTALS XMIT AND RECEIVE

AUDIO LAND has a complete ICOM line in stock for

immediate delivery

For more information write

Audioland

36633 S. Gratiot
Mt. Clemens Michigan 48043
313-791-1400
Attention: Amateur Sales Dept.

John M. Franke WA4WDL
1006 Westmoreland Avenue
Apt. 225
Norfolk VA 23508

How to Find a Satellite

A Simplified Graphical Technique for Satellite Orbit Prediction

The use of orbiting satellites by amateur radio operators is expanding rapidly. Amateurs were there to pick up the first beeps from Sputnik. Today with the Oscar series of satellites and the various weather satellites, the need for a simple orbit prediction method is increased. The technique used here evolved from such a need. I had been monitoring one of the Essa satellites for several months on weekends only. Each Saturday I monitored the receiver until I heard a pass. The next pass would be one hour and forty five minutes later. This accuracy sufficed for each weekend but the error in extending it to the next weekend was excessive. Broadcasts of equatorial crossings were available but that method appeared too complex. Surely a simpler method could be found that could be used when such broadcasts were available or not.

The answer was simple: to analyze experimental data you graph it and try to fit an equation to it. So I graphed both the orbits I heard and the predicted times for the previous and next orbit. The graph for several Saturdays is shown in Fig. 1. The horizontal axis shows the date and the time of observation is on the vertical axis. Only daylight hours are shown because the satellite was solar powered. With several weekends plotted, I began drawing straight lines connecting the points from one Saturday to the next and extending them on to the following

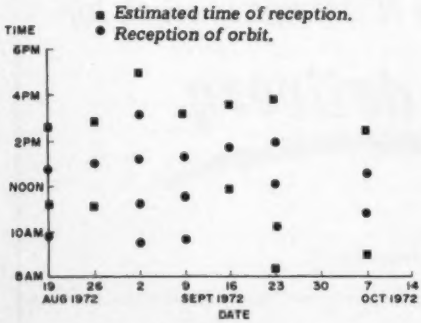


Fig. 1. Plot of Saturday receptions.

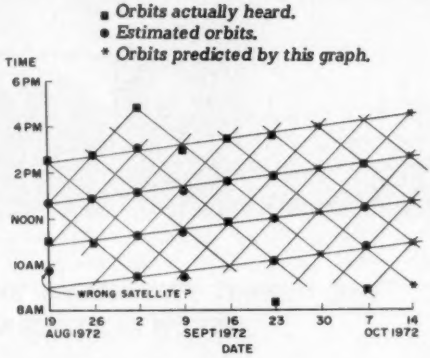


Fig. 2. Prediction lines for Saturdays.

Saturday. This is illustrated in Fig. 2. A pattern appeared. After all if the orbit is periodic then the pattern should be periodic. A similar gridwork was found for orbits heard on Sundays. The two grids are parallel. By extending the grid lines for any day, passes on that weekday in the future could be determined. The uncertainty of a prediction could be estimated by how well three or more prediction lines crossed. If they all cross at the same point, the accuracy is high. If they cross in an area several minutes high then the uncertainty is roughly equal to the number of minutes between the most separated lines. As more orbits are heard and plotted, the accuracy improves.

Reception times for days other than Saturday or Sunday can be determined as shown in Fig. 3. Here the results of two

NOW available for the first time in North America

the all NEW synthesized VHF FM TRANSCEIVER the KDK-144

Compare the features:

SYNTHESIZED – no more crystals
L.E.D. READOUT – for quick, easy readability
10KHZ FREQUENCY DIAL UP CAPABILITY 146-148 MHZ – Perfect for the 2nd generation of repeaters and simplex channels
600 KHZ UP AND DOWN REPEATER CAPABILITY
POWERFUL 2W AUDIO OUTPUT
10W.R.F. OUTPUT

Compare the sizes:

KDK-144	2" x 6 3/8" x 7 3/4" Deep
ICOM AC-230	2 9/32" x 6 1/8" x 8½" Deep
CLEGG FM 27B	3½" x 7 3/8" x 9¼" Deep

ONLY

$399

F.O.B. Blaine Wash.

HAM IMPORT SALES
P.O. Box 1009 Blaine Wash. 98230
(Washington State Residents add 5% Sales Tax)

73-1-2

Please Rush me a KDK-144. Enclosed is a ☐ cheque
☐ money order for $399. (plus sales tax if applicable)

NAME: .....
ADDRESS: .....
ZIP: .....

TONE BURST ENCODER

- New! Eleven tones in one encoder.
- LC oscillator. Stable; no RC circuits to drift.
- No batteries needed.
- Full one year warranty.

- Now, all the popular tone frequencies in one encoder. Panel switch selects 1650, 1800, 1950, 2000, 2100, 2250, 2400, 2550, 2700, 2850, 3000 Hz.
- High and low impedance outputs - works with all transmitters. Level adjustment provided.
- ½-second tone burst time also adjustable. Continuous tone if needed.
- Free descriptive brochure on request.
- Order direct. Price $37.50 PPD USA (5% tax Calif.)

PALOMAR ENGINEERS
BOX 455, ESCONDIDO, CA 92025

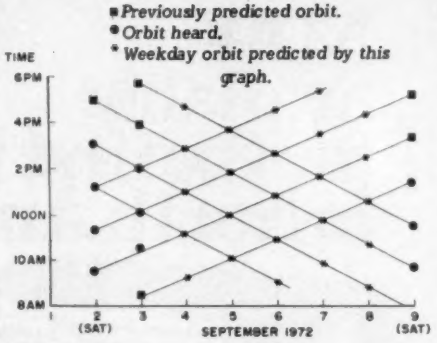


Fig. 3. Prediction of weekday orbits.

successive weekends are plotted. Drawing straight lines from one Saturday point through a Sunday point to a point on the next Saturday, a grid is generated. Where the grid lines cross each day a passage of the satellite should occur.

This method is simple, fast and easy on the brain. The power of graphing cannot be underestimated.

... WA4WDL

STARTLING LEARNING BREAKTHROUGH

You'll be astounded at how really simple the theory is when you hear it explained on these tapes. Nine year old children have used our cassette course to breeze through their novice exam! Three tapes of theory and one of questions and answers from the latest novice exams give you the edge you need to do likewise.

Most cassettes these days sell for $6 and up. But 73 is interested in helping get more amateurs, not being in the tape business. So we're giving you the complete set of four tapes for the incredibly low price of ONLY $13.95. And they'll play on any cassette player on the market!

SET OF 4 TAPES ONLY $13.95

ORDER TODAY !

Scientists have proven that you learn faster by listening than by reading because you can play a cassette tape over and over in your spare time – even while you're driving! You get more and more info each time you hear it.

You can't progress without solid fundamentals. These four hour-long tapes give you all the basics you'll need to pass the Novice exam easily. These days, the exam changes so fast that you can't memorize for it any more. Besides, this way you'll have an understanding of the basics which will be invaluable to you for the rest of your life! Can you afford to take your Novice exam without first listening to your tapes?

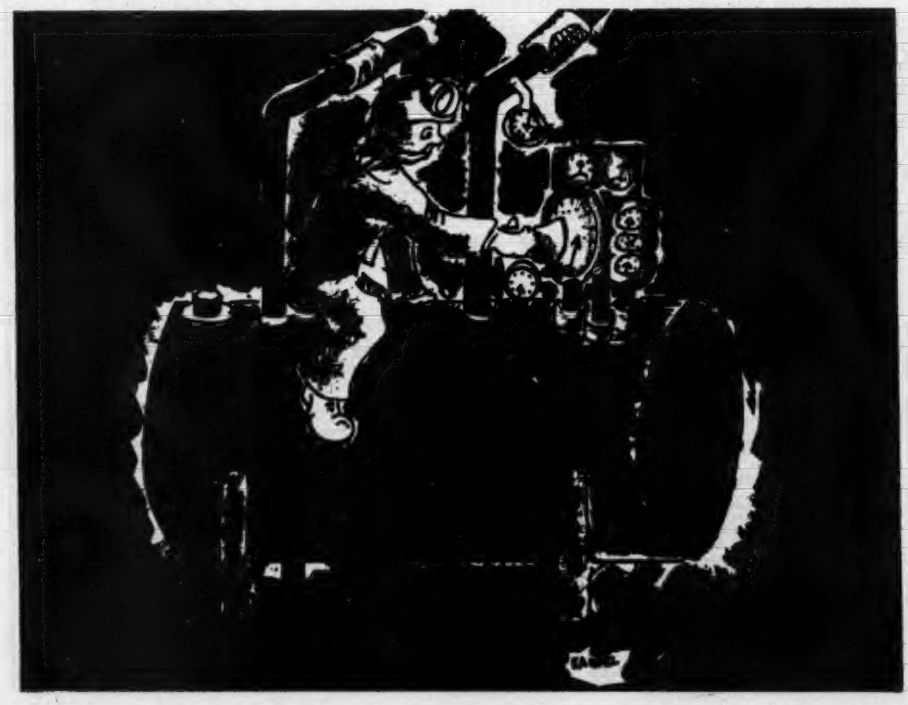
73 MAGAZINE, PETERBOROUGH, NH 03458

Peter A. Stark K2OAW
196 Forest Drive
Mt. Kisco NY 10549

Measuring Heating Oil Usage

Now that winter is here again, and with it another fuel shortage (or, at least, that's the way it looks in October as this is being written), it's time for you to apply your electronics know how to the problem.

Measuring how much heating oil you use is not easy. If your oil tank has a gauge, the best it probably does is to tell you whether



you have a half-tank or quarter-tank. And if you have an outside tank buried under your lawn, maybe you don't have a gauge on it at all. But with just a few dollars' worth of parts, you can measure your oil usage day by day, or even by the hour.

A typical oil burner has an oil pump, which pressurizes the oil up to around 100 psi; the oil is then squirted into the firebox through a nozzle which is calibrated in gallons per hour. To determine the number of gallons used, you only need to know how long the burner has run. This is easy to do with a running-time meter, which measures elapsed time.

To do the installation, get yourself a 110 V running-time meter which can be read down to the nearest 1/10 hour or better. The finer the calibrations on the meter, the better. If a 110 V meter is not available, you can use other voltages if you add an appropriate transformer. You mount the unit in a box at a convenient location, and connect it directly across the burner motor. Now every time the burner runs, the time meter runs as well.

Although you can use the nozzle calibration as a rough starting point, for best results you should calibrate the meter yourself. This is easy to do by dividing the total elapsed time between two oil deliveries into the number of gallons consumed. Repeating this calibration a few times should give you a fairly exact figure for the gallons-per-hour usage of your burner; the calibration should be repeated, of course, each time you replace the nozzle.

Once you know the calibration figure, you can easily compute the number of gallons of fuel used for typical household tasks. For instance, if you find that the burner uses 1.1 gallons per hour of running time, you can calculate how much oil your XYL uses in her 1 hour shower. In order to get the best accuracy, during this time you should turn down your thermostats so that the burner is used only for heating the shower water, and not for heating the house. This may leave her slightly cold when she comes out, but you can explain that's necessary for the progress of science. If you then find that the burner ran for 0.7 hour, your figure for the oil needed to heat her shower water is 0.77 gallons.

Other uses are possible too. For instance, on an extremely cold day during the winter you might find that your house simply does not get over 60 degrees and you're freezing. If, during a 24-hour period, you find that the running-time meter has run 23.5 hours, then you can suspect that the boiler/burner combination is too small for your house. On the other hand, if it has run only 12 hours, then you can suspect that the boiler/burner size is OK, but the distribution system (such as radiators and circulator pump) is too small to get all the heat produced in the boiler distributed into the house.

Finally, if oil rationing should come about, you can keep track of your daily oil usage and, if needed, cut down on your usage in the early part of the month so as to leave enough oil for the last few days of the month. You may not have any more oil, but at least such a system will allow you to keep from running out of your allotment altogether.

...K20AW

NOW

EXCLUSIVE 66 FOOT MORGAIN 75 THRU 10 METER DIPOLE

NO TRAPS – NO COILS – NO STUBS – NO CAPACITORS

Fully Air Tested – Thousands Already in Use

IS BACK

#16 40% Copper Weld wire annealed so it handles like soft Copper wire — Rated for better than full legal power AM/CW or SSB-Coaxial or Balanced 50 to 75 ohm feed line — VSWR under 1.5 to 1 at most heights — Stainless Steel hardware — Drop Proof Insulators — Terrific Performance — No coils or traps to break down or change under weather conditions — Completely Assembled ready to put up — Guaranteed 1 year — ONE DESIGN DOES IT ALL; 75-10HD — ONLY $12.00 A BAND!

Model 75-10HD. .$60.00. .66 Ft. .75 thru 10 meters
Model 75-40HD. .$40.00. .66 Ft. .75 thru 40 meters
Model 75-20HD. .$50.00. .66 Ft. .75 thru 20 meters
Model 40-20HD. .$33.00. .35 Ft. .40 thru 20 meters
Model 80-40HD. .$42.00. .69 Ft. .80-40-15 meter (CW)

ORDER DIRECT OR WRITE FOR FULL INFORMATION

MORGAIN 300 S. Shawnee Leavenworth, Kansas 66048

OR THRU YOUR FAVORITE DISTRIBUTOR

TECO

Teco is a subsidiary of Tucker Electronics. Tucker is the world's largest supplier of reconditioned test equipment, the original test instrument DISTRIBUTOR (with 18 lines of new test equipment), and the Southwest's leading repair and calibration facility.

5 Good Reasons Why YOU Should Buy Your Ham Equipment From TECO

1. Wats Communication: You can shop by either mail or by telephone, toll free. You merely dial 800-527-4642 and ask for Teco. Your questions will be promptly answered.

2. Trade-ins: We will allow top dollar for your excess test equipment in trade for new ham equipment. Typical trade-in allowances: HP 200 CD ($100.00), HP 608D ($600.00), HP 410B ($90.00), Bird 611 ($100.00). We will also take Ham and CB equipment and calculator trade-ins.

3. Financing: You can finance your purchase through BankAmericard, Master Charge or American Express, with up to 24 months to pay.

4. Shipping Facilities: Complete facilities for both domestic and export shipments.

5. Service: Teco is service oriented. Complete service facilities in-house. A complete comprehensive technical manual library is available to assist you with equipment problems.

TECO a subsidiary of Tucker Electronics Co.
SURPLUS TEST EQUIPMENT FOR BARGAIN HUNTERS
P.O. BOX 1050 1717 S. Jupiter Rd. GARLAND, TX. 75040
214—348-1560

Leonard Duschenchuk WA2KHK
255 Stewart Avenue
Bethpage NY 11714

Mod Squad Hits the SB-102

While working a lot of cw with my transceiver it soon became apparent that some control of the agc time constant and selection of agc to the "out" position would be desirable. Also, any modifications that are made should not require the drilling of new holes or marring of the front panel. In this way the unit could be restored to its original configuration.

This modification consists of adding two miniature switches on a small "L" shaped bracket which is mounted to the top right side of the LMO power supply cover utilizing the existing two self-tapping screws. A spst switch is used to control the agc time constant from either "fast" to "slow." The ground end of the existing 3300Ω resistor is raised from the printed circuit board and a small terminal strip is placed on top of the board under an existing screw that holds the circuit board to the chassis. The free end of the resistor is connected to the terminal strip lug. A wire connects from this tie point to the spdt switch as indicated in Fig. 1. At tube V13A, pin 1, the printed circuit foil is cut with an X-acto knife or razor blade. Two slices about 1/32" apart will give the required separation. Wires are now soldered to each side of the cut side of the cut foil and connected the dpdt switch as indicated. This is your agc "in-out" switch. Since the meter bridge circuit is now unbalanced when in the agc "out" position the meter will read below zero on the S meter scale. Not desiring to see meters read below zero the other pole of the dpdt switch was wired as shown. Now, when in the agc "out" position the meter will read zero as it should. This modification involves simply opening the existing black lead at the socket of V3 and placing the switch in series with the meter switch. With these modifications your transceiver will now have agc features normally found only on deluxe SW receivers. Use of the agc switches involves opening the hinged cover which is really no problem.

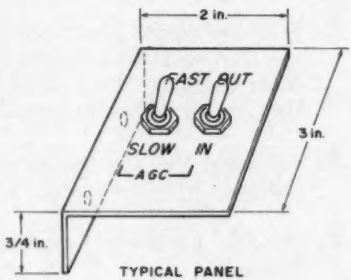


Fig. 2.

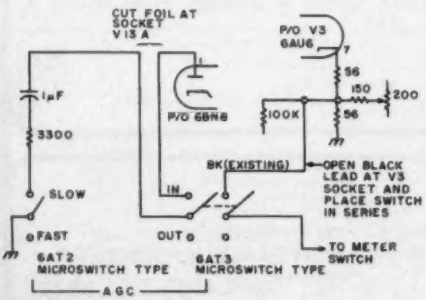


Fig. 1.

. . . WA2KHK

COUNT ON TECO

WHEN PRICE *AND* QUALITY ARE IMPORTANT

The Model 60 Frequency Counter (shown with 160 Hetrodyne unit) measures frequency from 1 KHz to 60 MHz with a full 5 digit readout (overranging feature provides an equivalent 8 digit display). With the optional 160 Converter, this tiny (less than 4 pounds) counter will also read 130 to 160 MHz with a sensitivity of 50 MV. With inputs of up to 100 MV, the unit will cover the full range of 110 MHz to 170 MHz. Only three switch controls provide complete operation—just plug in your signal and read the answer. Not a kit and no adjustments to be made!

- 10 MHz Crystal Time Base 1 PPM/Wk
- 1 KHz or 1 Hz resolution
- 115 VAC or 12 VDC operation
- Automatically positioned decimal

Model 60 with Manual and Accessories **$299.00**

Model 160 Converter..... **$ 50.00**

The Tucker Model 5509 Frequency Counter has a full 9 digit readout from 10 Hz to 550 MHz. The Tucker Model 5509 provides the finest resolution, highest accuracy, and highest sensitivity of any counter in this price range. Many features found on the Model 5509 can only be found on a counter costing much more. Like the Model 60, the Model 5509 is simple to operate—just apply the signal (10 MV or less) and select the frequency resolution required (from 1 KHz to 1 Hz) and you have the answer. No where else can you obtain a counter with the sensitivity, readout, and accuracy of the Model 5509.

- 10 MHz Crystal Time Base 1 part in 10^8/per day
- Sensitivity of 10 MV to 550 MHz
- Full 9 digit In-Line Display
- 115 VAC or 12/24 VDC with Option Power Converter available.

Model 5509 with Manual and Accessories **$950.00**

TECO a subsidiary of Tucker Electronics Co

P.O. BOX 1050 1717 S. Jupiter Rd. GARLAND, TX. 75040

214—348-1560

J. Stanley Podger VE3DNR
55 Gradwell Drive
Scarborough, Ontario
Canada

FM vs AM - - - which is REALLY BETTER - -

Recently, the use of FM on VHF has grown by leaps and bounds. So have the claims of the fans of this mode. Some have even told me that FM is superior to SSB for weak signal work. Perhaps it is time to objectively assess the relative merits of AM and FM under weak signal conditions. I will try to confine my bias to the title.

A few years ago, around Metropolitan Toronto, there were many 2 meter mobile AM stations. The average rig produced about 10W output. There were also many Twoers producing about ½W output. The popular antennas were halos and turnstiles. Along came the surplus FM rigs. Of course these commercial FM rigs did a better job. They had many things going for them.

1. The FM rigs produced about 40W output. Using the 10W AM rigs for comparison, that is 4 times as much power.

2. The commercial FM rigs used speech clippers as a guard against excess deviation. Hardly any AM rigs around here used speech clipping. You can get about a 10 times power advantage by using speech clipping.

3. The FM boys used vertical polarization. The AM boys used horizontal polarization. If you look at Fig. 8 in VE3AAZ's article in QST[1], you will see that a vertical antenna, 5 ft off the ground on a car, has a dB or so advantage over a horizontal antenna. For mobile-to-mobile operation, the FM boys have a 2 dB or so advantage. That is a power ratio about 1.6.

If we multiply these three power ratios, we have (4 x 10 x 1.6) a power advantage of 64. No wonder the FM boys do better than the AM boys. Note that none of these advantages are due to the FM mode. The AM boys could build rigs giving 40W out, use speech clipping and vertical polarization. So, the fact that the FM boys are doing much better than the AM boys says absolutely nothing about the relative merits of AM vs FM. The advantage is in the equipment, not the type of modulation.

A common claim for FM is that it is better in the presence of noise. This is valid or not, depending on how you look at it. Every respectable FM receiver has a limiter, which helps to reduce the noise. An AM receiver can also use a limiter. The FMers have an advantage because they can clip their waves as much as they want. The AMers must not clip too much or they will distort the desired wave. For AM, you must be able to control the degree of clipping to fit the amplitude of the wave in the receiver. Noise clipping is available to the FM man and the AM man, but it is easier for the FMer to use this technique.

Bandwidth plays a big part in noise suppression. If the noise is the high amplitude, short duration type, such as ignition noise, a wide bandwidth is better. Narrow bandwidths reduce the amplitudes of the pulses and increase the time during which they are present. This makes limiting less profitable because you are chopping off a smaller part of the pulse. Therefore, when impulse noise is the limiting factor, the wider bandwidths of the FM system are preferable to the narrower bandwidths of the AM system. But even this is not necessarily true. Better impulse noise suppression in either system can be obtained with some sort of noise silencer applied before the filters in the i-f amplifier. With such a silencer, the bandwidth of the i-f amplifiers would not be significant for this type of noise.

In the presence of random noise with low peaks, such as receiver noise, the situation is quite different. The power of such noise is proportional to the bandwidth. Twice as much bandwidth produces twice as much

ICOM

At ICOM the benchmark is quality.

ALL ICOM RADIOS HAVE....

- 5 Helical Resonators
- 0.4UV Sensitivity
- High and Low I.F. Filters
- Extremely Low Spurious TX
- Transmit and Receive Trimmers
- ESP
- 5KHz Freq. Deviation
- "S" Meter

INOUE'S NEW
PLL SYNTHESIZED
IC-230

- 67 + Channels (Direct or ±600 KHz)
- 30 KHz Steps (Optional 15 KHz)
- 146–148 MHz PLL Synthesized
- Modular Construction
- Socket For Tones or Dial
- Digital Readout (No Tuning)
- P.L.L. Lock Indicator
- $489.00

- 5 Channels Included
- 22 Channels Total
- No Relays
- Large Speaker
- Carrier Operated Light

IC-22

$249.00

IC-21A

- 24 Channels
- Discriminator Meter
- Wide Range – 144 - 148 MHz + MARS
- SWR Bridge
- AC Supply Built In
- DC Supply
- Modular Construction
- $449.00

TECO a subsidiary of Tucker Electronics Co.
P.O. BOX 1050 1717 S. Jupiter Rd. GARLAND, TX. 75040
214—348-1560

noise in the i-f amplifier. So the wideband FM system has a disadvantage to overcome. Comparing a 30 kHz FM system and a 6 kHz AM system, the AMers have a 5 to 1 power advantage with receiver noise before the signal gets to the detector. Clipping such noise is not nearly as effective as the clipping of impulse noise and both systems can use clipping anyhow.

The most interesting and significant characteristic of FM, in my opinion, is the capture effect. It is a factor characteristic of the mode itself. The factors noted above (bandwidth, use of clipping, etc.) were characteristics of the way in which the mode was used. When two signals are present in a system, the little one distorts the big one in amplitude and phase. The amplitude problem is reduced in the FM system by clipping. The phase distortion produces a more interesting story. If you do some vector analysis, as outlined by Terman[2], you will see that for a given ratio of signal amplitudes, the ratio of resulting deviations at the detector is large. That is, the little signal may be only a bit smaller than the larger signal in the i-f system but it will be much smaller after it gets through the FM detector. Even if a little signal is only slightly smaller than the big signal it will be clobbered by the detector.

Before the FM boys start celebrating, I should point out that it works both ways. When the desired signal is the biggest one, your signal captures the channel and you are the big winner. When the desired signal is the weaker one, as is often the case in ham radio, you lose your shirt. The performance in the presence of noise is similar. When the signal is stronger than the noise, the noise is suppressed. When the noise is bigger than the signal, the signal is suppressed. So there is a relatively sharp threshold of signal strength between solid copy and hopeless QRN.

The capture effect is most pronounced when the modulation index is high. For performance in noise, this means that a high modulation index, and therefore more deviation and bandwidth, gives more suppression of the weaker signal. Therefore, wideband systems have sharper thresholds of minimum signal strength, but this does not mean that you can receive weaker signals. A 1 to 1 signal-to-noise ratio is still the threshold.

The factor of the modulation index also produces different results at different audio frequencies. The relationship between the deviation and the modulation index is shown in the following equation.

$$\text{modulation index} = \frac{\text{deviation}}{\text{modulation freq.}}$$

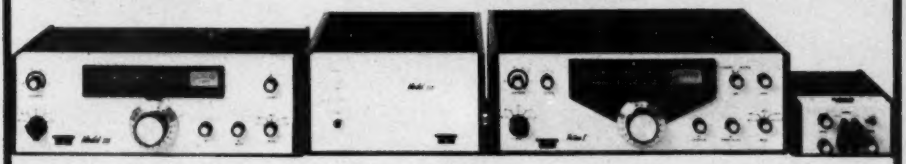
For a given deviation, lower modulation frequencies give higher modulation indexes than do higher modulation frequencies. That is, under weak signal conditions, noise suppression will be better for the low audio frequencies than for the high audio frequencies. Since the higher audio frequencies carry most of the intelligence, this is an important matter.

The higher audio frequencies are in bad shape in the presence of noise in any system. Random noise (receiver noise) varies according to the bandwidth. There is as much noise between 500 Hz and 600 Hz as there is between 2500 Hz and 2600 Hz. On the other hand, the human voice puts most of its power in the lower frequencies. The higher audio frequencies suffer a poor signal-to-noise ratio in any system.

To give the higher audio frequencies a fighting chance, the FMer uses pre-emphasis and de-emphasis. In the transmitter, the higher audio frequencies are made bigger than the lower frequences (pre-emphasis). This gives the higher audio frequencies a better chance against the noise. In the receiver, the higher audio frequencies (and the noise at these frequencies) are reduced to restore the original relationship in the speech. This trick can be applied in an AM system, but hardly anyone does. The FMers do it not only because it is a good idea for any system, but because they get a double benefit. Not only do they get more deviation at the higher audio frequencies, but the greater deviation gives better noise suppression in the other guy's detector. That is, in the receiver audio system, there is more signal and less noise.

So it is time to try to sum up. Let us assume that we have an AM transmitter and an FM transmitter, both running a legal 1 kW. If we are comparing the two systems alone, the differences are these:

TEN-TEC, INC. FROM TECO



The TRITON is a One-of-a-Kind HF transceiver, totally solid state including the final amplifier. The new generation that does more things better than ever before.

One, you can change bands instantly. Just turn the bank switch — and go!

Two, there is less internal heat to prematurely age components and no high voltage to break down insulation or cause accidental shock.

Three, it has ample reserve power to run at full rating even for RTTY or SSTV without limit. Great for contests or emergency service.

Four, it is light and compact with a detachable AC power supply to work directly from 12 VDC — For mobile operation without tedious installation.

Five, the TRITON is a delight to operate. SSB is clean, crisp and articulate. Amplified ALC puts all available speech power into the antenna without splatter. CW is wave-shaped to cut through QRM and pile ups. Instant break-in (not "semi" which really isn't break-in) lets you monitor the frequency while transmitting.

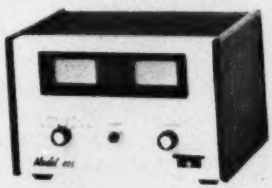
And six, a lot more goodies such as excellent dial illumination, plug-in circuit boards, offset tuning, built-in SWR bridge, speaker, crystal calibrator, boards, offset tuning, built-in SWR bridge, speaker, crystal calibrator, snap-up anti-parrallelax front feet, light indicators for offset and ALC, direct frequency readout, WWV, entire 10 meter band coverage — and a lot more.

The TRITON brings together all that is new and exciting in Solid State for your greater enjoyment of Amateur Radio.

TRITON I — 100 Watt Input $579.00
MODEL 251 — Power Supply $79.00

TRITON II — 200 Watt Input $669.00
MODEL 252 — Power Supply $119.00

Argonaut



Model 405 Linear

The sustained demand and the enthusiastic comments from happy Argonaut owners are music to our ears. We designed this portable pair to be fun, and your response tells us that it's just what you've been looking for. The Argonaut and it's companion, the 405 Linear, are here to stay — thanks to you.

Argonaut, Model 505 ..... $319.00
Linear, 100 Watt, Model 405 ..... $149.00
Power Supply for 505 only, Model 210 ..... $24.95
Power Supply for 505 and 405, Model 251 .. $69.00

TECO a subsidiary of Tucker Electronics Co.
P.O. BOX 1050 1717 S. Jupiter Rd. GARLAND, TX. 75040
214—348-1560

1. The FM signal has a poorer signal-to-noise ratio in the receiver i-f amplifier due to the wider bandwidth. If the FM system uses 5 times as much bandwidth, it suffers from 5 times as much noise power.

2. If the signal-to-noise ratio in the i-f amplifier for the FM signal is just a bit better than 1 to 1, the noise will probably be suppressed so much that the signal will be readable. The detector in the AM system does not improve the signal-to-noise ratio.

With equal transmitter powers, when the FM receiver has a 1 to 1 signal-to-noise ratio (its threshold) the AM receiver has a 5 to 1 power signal-to-noise ratio. So, I submit, the debate should be on the question of whether an AM signal, with clipping and pre-emphasis, can be copied when the power signal-to-noise ratio is 5 to 1. That is a bit over 1 s-point. From my observations on 2 meters, I would say that AM signals two s-points out of the noise are easily readable. With clipping, which is hardly ever used around here, signals one s-point out of the noise should be readily readable. Signals weaker than one s-point out of the noise should be readable with difficulty. Just where the threshold of readability is for AM signals is a matter for debate, but surely the difference between the two systems for weak signal work is small.

You might object to comparing two 1 kW transmitters, so let us deal with the transmitter conditions. What is a fair comparison depends on your point of view. If money is not a problem, you run all the power that the law allows. The above analysis assumes this sort of condition. If you are comparing the two modes with the same final tubes, FM has a small advantage. Tubes usually are rated for more plate dissipation for FM than for plate modulated AM. For a given dc power input, AM also requires a higher peak power capability than does FM. If you want to compare total power drain, AM needs not only the carrier power but almost as much modulator power, if heavy clipping is used. That figure of ½ the carrier power for the modulator that is usually used, is based on sine wave modulation, not clipped speech. Therefore, the cost factors in the transmitter are very much in the favor of FM.

FM is a fine mode when you are sending to the general public (broadcasting) or for those who use radio for business (taxis, police, etc). Such people have little patience with signals that are not free of noise. FM can offer noise-free reception even when the signal is only a bit stronger than the noise. But hams are communications nuts. They love to dig in the noise to work a distant station. We should not assume that FM is best for us just because the commercial VHF mobile services use FM.

If you really want a superior mode, there is always SSB or CW. SSB, particularly with rf clipping in the transmitter, is definitely superior to AM or FM for weak signal work, but that is another argument. If SSB is too rich for your blood, how about some double sideband, suppressed carrier, with clipping? Since the QRM on VHF is no great problem, almost any communications receiver can do an adequate job on sideband, following a crystal controlled converter. A DSB transmitter with clipping is not very hard to build.

Repeaters changed the situation completely, of course. Sideband, single or double, is not practical via repeaters, leaving us with AM or FM. The large amounts of surplus commercial FM equipment got amateurs started with FM and repeaters, so naturally when equipment built for hams came along, it too was FM.

If it hadn't been for repeaters it seems likely that sideband would have eventually forced the other modes to give way since it is inherently superior where there are no repeaters to extend the range of "base" stations. But all is not DX on 2m and thus repeaters and FM have just about completely eliminated the competition in virtually every part of the country.

At any rate – the next time a dyed-in-the-wool FMer starts talking about the tremendous advantages of FM over other modes, you will have some ammunition to make the contact interesting – interesting for *you*, at least. ...VE3DNR

References

[1] *"Antenna Behavior Over Real Earth,"* Walter H. Anderson, VE3AAZ, QST, June 1965, p. 61.

[2] *"Electronic and Radio Engineering,"* F. E. Terman, McGraw-Hill, p. 962.

Give Your Signal A

DOUBLE BOOST

And Spend More Time Communicating

1 **Let an ALPHA 374 Bandpass Linear deliver all the power you can** legally use (in any mode, continuously!) *and* eliminate the chore of amplifier tune-up, too. Using a **'374,** maximum legal power with true 'instant band change' is a reality.

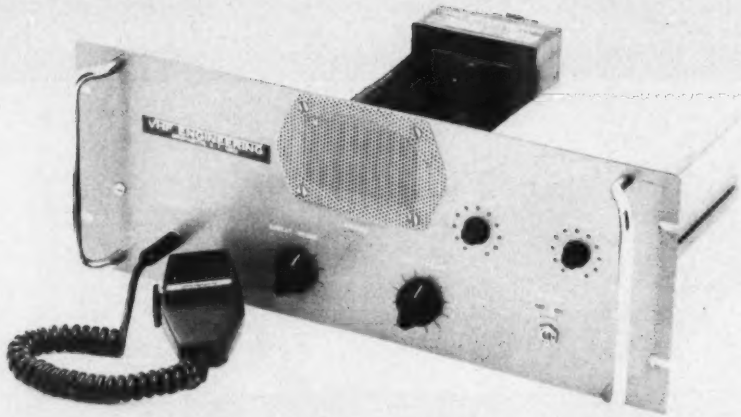
2 **Add even more punch and crispness to that big signal with a** Magnum Six rf speech processor (or a DX Engineering model, if you prefer). The rugged *continuous duty* **ALPHA 374** easily handles the extra *average power* demanded by an effective rf speech processor. Buy a "no-tune-up" **'374** in February and we'll sell you an rf processor for *ONE-THIRD price*!

With *any* **ALPHA** maximum-legal-power linear you'll enjoy a new level of convenience and operating pleasure. Don't wait – see your dealer or contact ETO now for details.

The ALPHA 77D "ULTIMATE LINEAR" – latest in the fabulous ALPHA Seventy series – is now available. Call or write for information.

TECO a subsidiary of Tucker Electronics Co.
P.O. BOX 1050 1717 S. Jupiter Rd. GARLAND, TX. 75040
214—348-1560

George R. Allen W1HCI
Bob Brown W2EDN



Build Your Own Repeater - for only $365

VHF Engineering Kits Simplify Construction

Construction of a repeater has been difficult and complex by tradition. This is not because repeater construction must be difficult and complex, but because it just sounds hard. In addition most repeater builders have not used an adequate repeater design, have made poor equipment choices, and have encountered horrendous problems of their own making. The fact is that repeater construction is simple and straightforward provided that a sound design is used and a practical construction approach is taken. We herein describe a simple approach to repeater construction and provide a pattern for building a repeater from scratch. The approach taken is not to give every option, alternative, or possibility for every modular piece of the repeater. Instead, a complete, workable design for a 15 watt 144 MHz repeater is described.

This article gives the necessary instructions for building, packaging, troubleshooting, and maintaining a workable 144 MHz repeater and gives a parts list with the names and addresses of suppliers. The resulting repeater will compare favorably with most commercial repeaters available on the market today.

Equipment Selection

The radio equipment selected for the repeater is listed at the end of the article (see Table 2). The VHF Engineering equipment was chosen over other units for a number of reasons. The equipment is very inexpensive and its performance equals the performance

of many commercial units. It is fully solid state and thus will have greater reliability than tube units. It is available in kit form, which means that the repeater builder will have to hand wire his own major components. By building the equipment himself, the repeater engineer will get a good feeling for the operation, adjustment, and maintenance of his equipment. Thus, after the repeater is placed in operation, the repeater engineer will be able to maintain it and keep it on the air. There is great danger in buying commercially built equipment unless you are very familiar with it. It is easy to make a repeater operational only to find that you can't keep it on the air. All of the VHF Engineering equipment operates from 12 V dc; thus, in a power failure, the repeater can be operated from a 12 V battery.

Many circuits have been published for the construction of solid state identifiers. While any of these circuits may be used, the design presented here uses a commercially available kit. Identifiers are difficult to build and difficult to debug if problems are encountered, unless of course, the repeater builder has a background in digital logic. Both time and money economies lead one to buy such a commercially available unit. This repeater uses the ID from Signal Systems. This unit was selected because of its good performance at low cost ($34.00/kit), ($39.00/wired and tested).

The antennas chosen are the ½ wave Ringo from CushCraft. These antennas are low in cost, easy to mount, and have their patterns on file with the FCC.

Coaxial cable is one item overlooked in regard to quality. The selection of poor grade cable can negate all of the gains introduced in the system by using top quality equipment. Do not skimp on cable: Use a good grade of 50 Ohm foam as recommended in Table 2.

Assembling The Kits

Even before thinking about assembling the repeater, it is first necessary to build the individual kits and make sure that they are correctly aligned. It is important to meticulously follow the instructions with each kit. Do not substitute components or attempt to make improvements in the circuits, except as indicated in this article. Make sure that the receiver, transmitter, amplifier, and COR are working correctly as independent units. Do not attempt to hook the units together until each unit operates independently. If problems are encountered, troubleshooting individual units is easier than troubleshooting the system as a whole.

Modifications

For repeater use, minor modifications should be made to the transmitter and receiver, as follows:

Transmitter (refer to instruction manual)

Connect a 100 k resistor between the cathode of D1 and the junction of R19, R20, C31 and C35. This puts a bias of 4 V on the varactor modulator and improves the audio symmetry. Connect a 1.2 k resistor to the junction of R10 and R11 to form the line input. Connect a 1 uF tantalum from the B+ connection to the ground. Place this capacitor right on the board.

Receiver (refer to instruction manual)

Connect a 10 Ohm resistor and .1 uF capacitor from pin 8 of the LM380 to ground to eliminate possible oscillation in the audio stage. Connect a 100 uF capacitor from B+ (audio board) to ground. Place this capacitor right on the board.

Packaging

This simple repeater can be packaged in a variety of ways depending on the whims and tastes of the individual builder. For sake of completeness, however, a single packaging scheme is presented in this section of the article (see Fig. 1). The repeater shown in the photographs was built according to the directions given here and is currently in use at WR2ABS .22-.82 in Binghamton, New York.

As previously mentioned, it is important to maintain complete rf isolation betweeen the transmitter and receiver in order to prevent desensitization from occurring. This is accomplished in this design by mounting the transmitter and power amplifier in a Barry Electronics #085A enclosure. (A smaller usable alternate is a BUD CU247.) The receiver is mounted in a separate 085A enclosure and the two enclosures are in turn mounted on a BUD AC-416 chassis. The

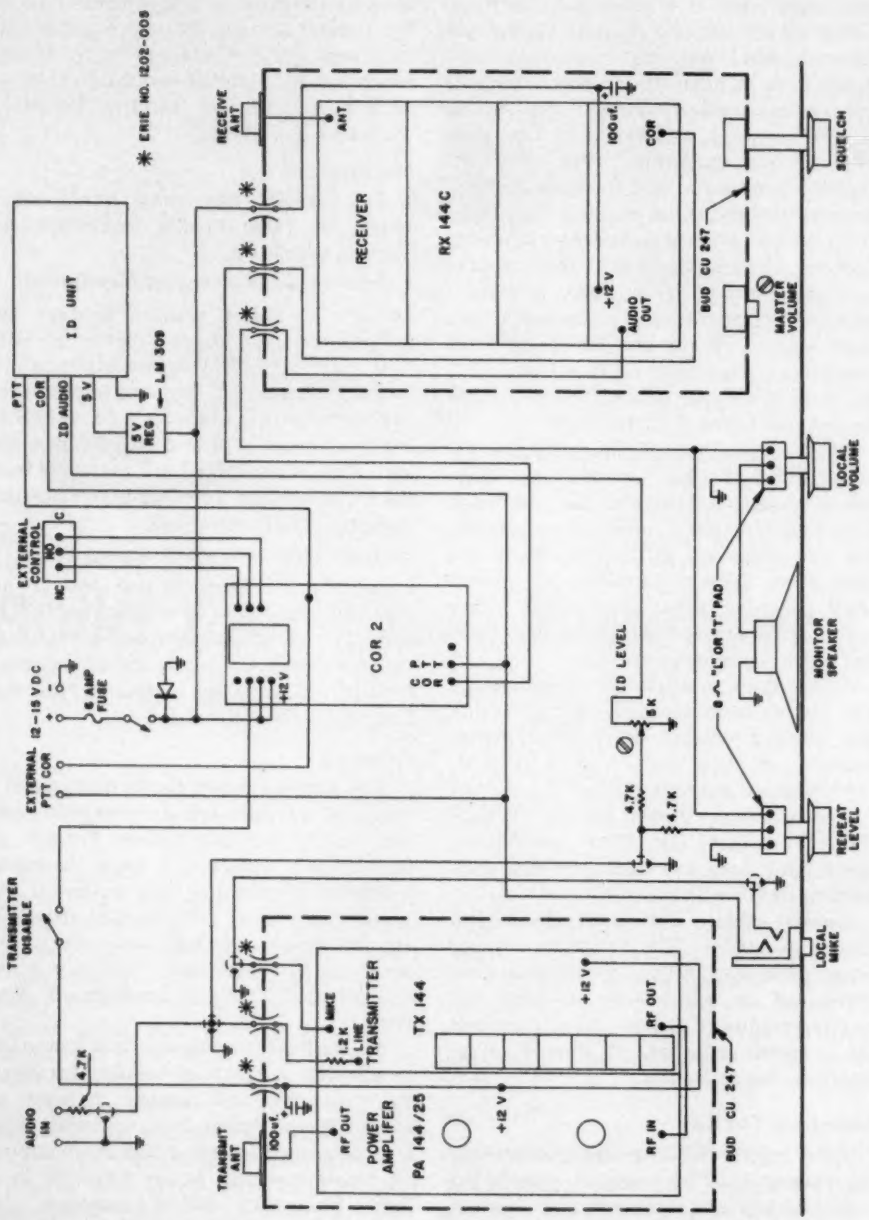


Fig. 1. Wiring System

power supply is built on this main chassis between the two enclosures, with the power supply pass transistors mounted and heat sink on the rear of the main chassis. The front panel is a standard 7" x 19" panel for rack mounting.

Follow the general layout shown in the photographs. When mounting the power transistors for the power supply, care should be taken to use a good silicone heat sink compound on all contact surfaces. Also, before mounting the rf power transistor to the case, coat both the studs and flange with a liberal amount of silicone heat sink compound. The transmitter and receiver boards are easily mounted by soldering them to a right angle brass strip fashioned from shim stock. See Fig. 2. All power leads and circuit connections from inside the enclosures are run to the outside via feed through capacitors. Erie #1202-005 feed throughs are preferred, as they provide a maximum of attenuation. If these feed throughs are not available locally, other good quality units may be substituted.

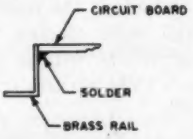


Fig. 2. Method of mounting receiver and transmitter. Brass rail is bent from brass shim stock, obtained at automotive or hobby shop.

The die cast box is adequate heat sink for the 15 watt version. If the builder uses a 25 W power amplifier, additional heat sinking should be bolted to the side of the transmitter enclosure. Be sure to use a liberal amount of silicone grease. In addition, for a 25 W version, the pass transistors for the power supply will require larger heat sinks to prevent overheating. A Thermolly #6146-2 heat sink is recommended. Three are required. For continuous repeater operation, it is advisable to run the power supply voltage at around 12 V instead of the normal 13.8 V.

The "audio in" jack is provided for use with external gadgetry such as a phone patch. Mount all units in their respective enclosures prior to testing.

Voxpoop

While we are to some extent a prisoner of the authors of the articles – if they don't write them we can't print them – still we do like to know your reaction to what we do publish so we can keep trying to bring you what you enjoy the most. In the interests of science then, please let us know which articles you enjoyed the most and which you disliked most. The author of the article with the most votes will get a check for $50 extra to encourage him to get busy and write more.

WOW!

UGH!!

VOXPOOP, 73, Peterborough NH 03458

YOU ASKED FOR IT!
ECM-5B FM Modulation Meter less batteries and crystals
***Only* $99.95**

- 0-7.5 kHz deviation peak reading Meets commercial requirements
- Operates 30-500 MHz
- Crystal controlled for easy operation
- Telescopic antenna

NEW C ONS
- NICAL ower pak $20.45
- Charger $29.95
- Audio/scope output with earphone $12.95

Write or call for complete info
Send check or money order for $99.95 plus $1.50 for shipping. Indiana residents add 4% sales tax. Crystals for 146.94 MHz $3.95. All other freq: $7.10.

ECM ECM Corporation
412 North Weinbach Ave.
Evansville, Indiana 47711
812-476-2121

C F P ENTERPRISES
866 RIDGE ROAD, LANSING NY 14882
No other amplifier even comes close
ALPHA 374 by ETO
Here is amateur radio's only state-of-the-art broadband, full legal power linear amplifier.
- Instant Bandchange without tune-up
- Self-contained desk-top cabinet
- Eimac ceramic tubes (1200 watts rated dissipation)

Write today for complete details on this exciting new linear.
Office & Salesroom Hours by Appointment Only
24-Hour Phone: 607-533-4297
Send SASE for Monthly Listing of Used Equipment and Bargain Goodies

LATEST RELEASES from 73 publications

PRACTICAL TEST INSTRUMENTS YOU CAN BUILD

37 simple test instruments you can make — covers VOMs, VTVMs, semiconductor testing units, dip meters, watt meters, and just about anything else you might need around the test lab and ham shack. **$4.95**

RF & DIGITAL TEST EQUIPMENT YOU CAN BUILD

RF burst, function, square wave generators, variable length pulse generators — 100 kHz marker, i-f and rf sweep generators, audio osc, af/rf signal injector, 146 MHz synthesizer, digital readouts for counters, several counters, prescaler, microwavemeter, etc. 252 pages. **$5.95**

73 Magazine, Peterborough NH 03458

Enclosed is $ ____ Rush me

☐ RF and Dig. Test Equipment

☐ Practical Test Inst

Call _____

Name _____

Address _____

City _____

Zip _____

Measuring RCVR Sensitivity

One of the preliminary procedures to perform before assembling the repeater is to measure the sensitivity of the receiver. By doing this at the beginning you can get a feeling of what type of performance to expect. In addition, by keeping a record of your measurements you have a reference to go by at a later time if you think that the performance of the repeater has changed.

The preferred method of measuring receiver sensitivity is the 12 dB SINAD sensitivity method.[1] This method gives accurate measurement of how easily a modulated signal can be understood in the presence of noise. Unfortunately, one of the pieces of equipment needed for this method is a distortion analyzer, a device not normally found in the ham shack. An easier but less meaningful technique is the 20 dB quieting method, described here because of its simplicity.

20 dB Quieting Method

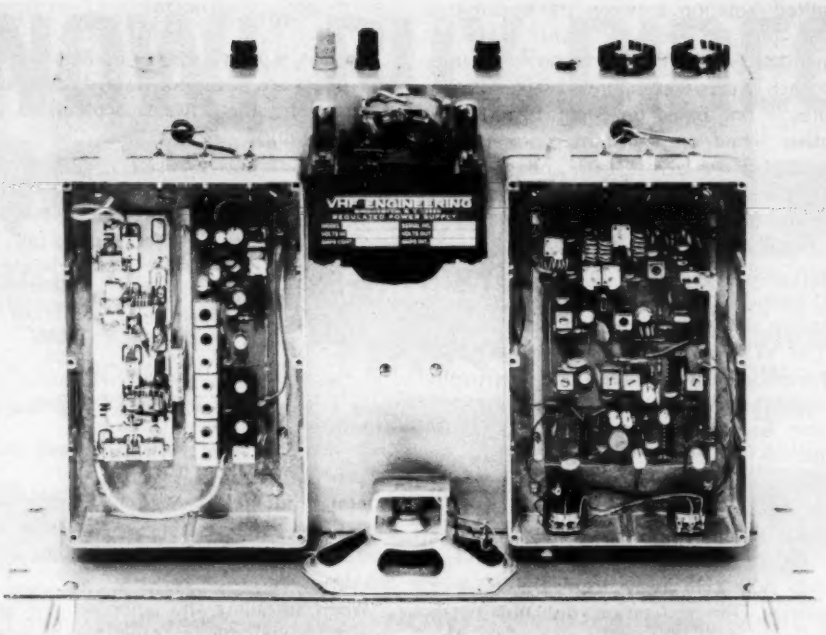
1) Connect a VTVM across the speaker terminals of the receiver. Set the VTVM on a low ac range and adjust the volume control to give 2/3 full scale reading. Note: For convenience, a VTVM with a dB scale is handy. If your VTVM has this scale, set the meter at +20 dB.

2) Connect a calibrated output signal generator to the antenna input of the receiver, set the generator to the proper frequency, and set the output to zero.

3) Increase the output of the signal generator until the meter reading is reduced by 20 dB. This is a ratio of 10:1 — if the original reading was 1 volt, the 20 dB quieting reading would be .1 V. The output reading on the signal generator in microvolts is now the 20 dB quieting sensitivity of the receiver.

Repeater Range

If you have the interest and the time you may wish to consider one of the various techniques for computing repeater range. One such method which gives fairly good approximations is described in the General Electric Data File Bulletins 10003-1, 10003-2.[2] The problem with the theoretical approach is that you can only get an



Top view of repeater showing mounting of modules. Note feed-through capacitors for all power leads.

approximate determination of the range. It is impossible to get an exact picture of the coverage area of your repeater without actual measurements, due to abnormalities in terrain, types of soil, and other factors. Most repeater builders place a transceiver at the proposed repeater location, and, using the repeater antenna temporarily mounted at the proper height, run tests with mobiles throughout the proposed coverage area.

It is poor practice to use significantly more power than is needed for the desired coverage area, since by doing this your repeater may interfere with repeaters in other areas. It is also poor practice to determine the coverage area of a repeater by putting the repeater up first and then driving around "see how it gets out." Plan first, running tests, so that you can determine if location and power are sufficient before you put the repeater on the air. By taking this approach, you have the flexibility to select another site and increase power, without worrying about possible license modifications.

Isolation Between Transmitter and Receiver

When setting up a repeater, care must be taken to avoid getting too much transmitter power into the receiver. If this occurs, the receiver will be "desensed" and will be unable to receive anything but very strong signals. In addition, care has to be taken to avoid getting spurious noise from the transmitter into the receiver. In order to prevent the transmitted signal from causing problems in the receiver, it is necessary to isolate the transmitted signal from the receiver. This can be accomplished by separating the transmit and receive antennas, by using sharp filters, by using cavities, or by a combination of techniques.

Determining The Amount of Isolation Needed

The best approach to determine the

required isolation between the transmitted signal and the receiver is that taken by General Electric Mobile Radio.[3] In their approach, they compute two isolation figures – one based on desensitization and another based on transmitter noise. They then choose the largest figure and use this as the required isolation. In our case, we don't have the required transmitter noise figures, so we will base our calculations on desensitization and assume that noise from the 15 watt amplifier is included in this figure. This approach will give reasonable accuracy.

The VHF Engineering receiver will take without desensitization 24,000 microvolts of signal removed 600 kHz away from the receive frequency. This figure was determined in the VHF Engineering labs by feeding a 1 microvolt signal into the receiver at the signal frequency and then also feeding a signal from a signal generator into the antenna through a "T." The generator was set up 600 kHz away from the receiver frequency. Desensitization did not occur with levels of 24,000 microvolts or less. The required external isolation can be determined by calculating the transmitter output power in microvolts and determining the dB relationship between the transmitter power and the tolerable level of 24,000 microvolts. In other words we must determine the isolation required so that the receiver does not see a signal from the transmitter which is greater than 24,000 microvolts. Under this condition, we will have no desensitization. Note that we are making the assumption that we will have signal strengths of 1 microvolt or better.

The required dB of isolation is computed by the formula:

$$20 \text{ Log } \frac{\text{xmtr pwr in microvolts}}{24{,}000}$$

In order to get the power in microvolts across a 50 Ohm load, use the formula:

$$V = PR$$

then multiply V by 10^6 to give the voltage in microvolts. As an example, assume a transmitter power of 15 watts. Using the formula:

$V = PR$, $V = 15 \times 50 = 27.4V$ or $\pm .74 \times 10^7$ microvolts.

The isolation in dB is then computed as:

$$20 \text{ Log} \frac{2.74 \times 10^7}{2.4 \times 10^4} = 61 \text{ dB}$$

In this repeater design, cavities or front end filters are not used; instead, isolation is obtained by the antenna separations provided in Table 1.

In our example, a vertical separation of about 50 feet or a horizontal separation of about 825 feet would be needed. Note that in the case of vertical separation, the antennas must be in a straight line over each other with no horizontal separation. Horizontal separation (although inconvenient) may be used.

dB Isolation	Vertical Separation	Horizontal Separation
40	13 feet	85 feet
50	22	250
60	45	800
70	75	2350*

Table 1. (from General Electric Co., "Data File Bulletin", 10007-4, pp. 14-15)
*Figures approximate; isolations of much greater than 62 dB may be hard to achieve.[4]

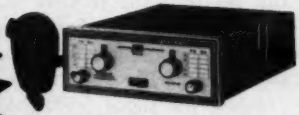
When installing the antennas, use good quality coaxial antenna cable and be sure to waterproof antenna connections. Keep in mind that some leakage can occur from the coaxial cable. For this reason, it is a good idea not to tape the receive and transmit cables together as they come down the tower. Separate the cables by 6 or 12 inches.

Once the antennas are erected, the actual isolation should be measured. By doing this, you can check to see if you are getting the isolation that you predicted. If you are getting less isolation, you may have to increase the vertical spacing or use front end filters as previously mentioned. The amount of isolation can be measured as follows: Using a calibrated output signal generator, connected to the receiver, determine the signal required for 20 dB quieting. Next, connect the receive antenna to the receiver and the transmit antenna to the signal generator, and increase the output of the generator until you get a 20 dB quieting signal on the receiver. Take the two readings from the signal generator and compute the path loss by the formula 20 Log S1/S2, where S1 is the signal strength in microvolts of the generator into the antenna and S2 is the signal strength in microvolts directly into the receiver.

NOW! BUY DIRECT

GTX-600 6-Meter FM
100 channels, 35 watts
WAS $309.95
NOW
$219.95
(Incl. 52.525 MHz)

Look at These
UNBEATABLE
PRICES!



GTX-100 1¼-Meter FM
100 channels, 12 watts
WAS $309.95
NOW
$219.95
(Incl. 223.5 MHz)

GTX-200 2-Meter FM
100 channels, 30 watts
WAS $299.95
NOW
$199.95
(Incl. 146.94 MHz)

GTX-2 2-Meter FM
10 channels, 30 watts
WAS $299.95
NOW
$189.95
(Incl. 146.94 MHz)

GTX-10 2-Meter FM
10 channels, 10 watts
WAS $239.95
NOW
$169.95
(Incl. 146.94 MHz)

CLIP OUT AND ORDER NOW!

GENAVE, 4141 Kingman Dr., Indianapolis, IN 46226 73

HEY, GENAVE! Thanks for the nice prices! Please send me:

- ☐ **GTX-600** @ $219.95 $_____
- ☐ **GTX-200** @ $199.95 $_____
- ☐ **GTX-100** @ $219.95 $_____
- ☐ **GTX-2** @ $189.95 $_____
- ☐ **GTX-10** @ $169.95 $_____
- ☐ **Lambda/30 2-M Base Antenna** @ $39.95 $_____
- ☐ **Lambda/4 2-M Trunk Antenna** @ $29.95 $_____
- ☐ **TE-1 Tone Encoder Pad** @ $59.95 $_____
- ☐ **PSI-9 Port. Power Package** @ $29.95 $_____
- ☐ **PS-1 AC Power Supply** (less batteries) @ $49.95 $_____

and the following **standard** crystals @ $4.25 each:_____ $_____
Non-standard crystals @ $5.75 each — allow 8 weeks delivery.
For factory crystal installation add $8.50 per transceiver.

Sub-Total $_____ Ind. residents add 4% sales tax: Cal. residents add 6% sales tax:_____ **TOTAL:** $_____

All orders shipped post-paid within continental U.S. For C.O.D., Include 20% Down.

NAME _____ AMATEUR CALL _____

ADDRESS _____ CITY _____ STATE & ZIP _____

Payment by: ☐ Certified Check/Money Order ☐ Personal Check ☐ C.O.D.

Note: Orders accompanied by personal checks will require about two weeks to process.

☐ 20% Down Payment Enclosed. Charge Balance To:

☐ BankAmericard #_____ Expires _____

☐ Master Charge #_____ Expires _____ Interbank #_____

Prices and specifications subject to change without notice.

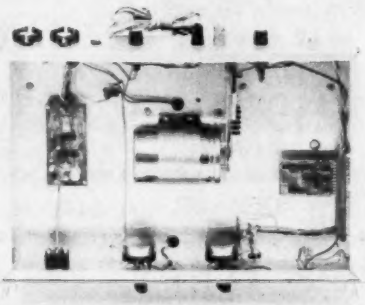
Shielding

While it is necessary to maintain the required antenna separation in order to prevent desensitization, this separation is of no value if the output from the transmitter can get into the receiver via other means. This can happen if the transmitter and receiver are mounted back to back in the same cabinet, or if the power cables are carrying the signal from the transmitter to the receiver. In order to make sure that the only signal paths in the system are the antennas, it is necessary to provide complete rf isolation for the transmitter and receiver themselves. This can be accomplished by using standard shielding practices for both the transmitter and the receiver. (See the ARRL *Handbook*).[5] The transmitter, amplifier, and receiver should be enclosed in metal boxes and the associated power and control cables should be well bypassed, as indicated in the packaging section of this article.

After the transmitter and receiver have been properly shielded and bypassed in metal boxes, a test should be made to see if the shielding is complete. Connect a meter to the first limiter (test point "A"; refer to instruction manual page on the FM-455A module) of the receiver (receiver on input frequency) with antenna terminals connected to a 50 Ohm resistor at the receiver. Place some electrical tape over the resistor and cover the connector with tightly wrapped aluminum foil. Do this to prevent any rf from getting in via the antenna jack. Connect the transmitter to a shielded dummy load. With the transmitter and receiver in their final locations in the equipment cabinet, key the transmitter and observe the first limiter current. If the current changes either down or up, then you have a problem with either the signal or transmitter noise getting in the receiver. In either case, isolation between the transmitter and receiver is not good enough. If this is the case, check the bypassing of all leads and make sure that all shields are making good electrical connections.

Final Tests

Having completed the previous steps, mount the individual enclosures on the main chassis and complete final wiring as shown in the top view photograph. Note that the identifier shown is hooked up according to the manufacturer's instructions. After hooking up the repeater, tests should be made to see if desensitization or transmitter noise is present. Connect a "T" coax connector in the receiver antenna lead, connect the antenna to one input, and connect the calibrated output signal generator to the other input. Feed a signal in for 20 dB quieting as you did when checking receiver sensitivity. (Note: If it takes more signal this time, you have noise from an outside source getting into your antenna.) Key up the transmitter and observe the first limiter reading. If the current increases, then transmitter noise is getting into the receiver. If the current goes down, then desensitization is the problem. Ideally the limiter current will not change. If the limiter current changes, the signal will become noisy. Readjust the signal generator to again give a full



Bottom view of repeater. Additional heatsinking required on the two power transistors located top left on the 25 W model.

quieting signal. The amount of desense or noise is then 20 log S1/S2 – S1 and S2 being the two readings on the signal generator.

If either of these problems occur, it may take quite a bit of effort to effect a workable cure. One simple, but disadvantageous, cure is to reduce the transmitter power by ½ or 3 dB. Many times this will provide a temporary solution to your problems. In the case of clear cut densensitization, it is necessary to increase the effective signal isolation between transmitter and re-

ceiver. This can be done by increasing antenna spacing or by better shielding of the transmitter, amplifier, and receiver. If the previously mentioned test and checks are successfully made, desensitization should not be a problem. In regard to transmitter noise, this problem can be stubborn since the problem can be caused by a bad output transistor. The most effective way to eliminate this problem is to insert in the transmitter feed line a HI-Q cavity tuned to "suck out" at the receiver frequency.

At this point, if all problems are solved, the repeater is operational and ready for use with the exception of required means of control.

Extended Local Control

Repeater control can be done on either a local or remote basis, the only difference being the actual location of the on-off switch. Local control is by far the simpler of the two, having the advantages of both easier installation and easier licensing.

Such control can be either a switch right at the repeater or a switch on the premises away from the equipment (extended local control). Fig. 1 shows a simple enable-disable switch at the repeater. This switch disables the repeater by interrupting the current to the transmitter. For extended local control, a relay is used instead of the switch, and wires to control the relay are run to the remote location. Note that it is necessary to monitor the repeater during its period of operation. 73 Magazine and the ARRL should be consulted on current accepted and legal techniques for doing this.

Getting the License

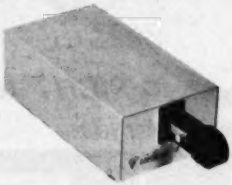
At the present time, there is no sure fire way to get a license for a repeater in a short period of time. In addition, the application requirements are changing rapidly from day to day. Your best bet on getting your license is to write to both 73 Magazine and the ARRL and ask for all information and forms available.

Responsibilities of Operation

Before you undertake to build a repeater, you must recognize the fact that there are serious responsibilities involved with

DATA SIGNAL

the latest in station accessories



CRICKET 1 ELECTRONIC KEYER

A popularly-priced IC keyer with more features for your dollar. Cricket I is small in size and designed for the beginner as well as the most advanced operator. It provides fatigue-free sending. Easy to copy at all speeds. Turn on its side and use as a straight key for manual keying. AC/DC.

Shipping Weight 3 lbs. $49.95

SPACE-MATIC 21-B

The Switchable Keyer. It's up to eight-keyers-in-one. Use the switches to make this your very own personal keyer, both today and tomorrow. Add such features as dot dash memory or adjust spacing with the turn of a switch. Completely perfect.

Sh. wt. 4 lbs. $119.50

TOUCH-TONE DECODER

A highly reliable twelve digit decoder with input protection, and PLL circuitry for extremely stable operation. Heavy duty output relays, small size, plug-in circuit board. All these major features at an UNBEATABLE price.

	Sh. wt. 1 lb.
TTD-12K Kit	$114.50
TTD-12 Touch-Tone Decoder	$129.50

Write today for complete details

Data Signal, Inc.

Successor to Data Engineering, Inc.

2212 Palmyra Road

Albany, Ga. 31701

912-435-1764

YOU WOULDN'T START A LOG IN MARCH

RIGHT NOW

is the time to order your

75 callbook

Don't wait until 1975 is half over. Get your new **Callbooks** now and have a full year of the most up-to-date QSL information available anywhere.

The new **1975 U. S. Callbook** will have over 300,000 W & K listings. It will have calls, license classes, names and addresses plus the many valuable back-up charts and references you have come to expect from the **Callbook.**

Specialize in DX? Then you're looking for the new, larger than ever **1975 Foreign Callbook** with over 225,000 calls, names and addresses of amateurs outside of the USA.

United States Callbook
All W & K Listings
$12.95

Foreign Radio Amateur Callbook
DX Listings
$11.95

Order from your favorite electronics dealer or direct from the publisher. All direct orders add 75¢ shipping and handling per Callbook.

WRITE FOR FREE BROCHURE

RADIO AMATEUR callbook INC.
Dept. B 925 Sherwood Drive
Lake Bluff, Ill. 60044

repeater operation. For example, if the repeater is illegally used, you are responsible. In addition, once your repeater becomes operational you have a responsibility to the amateurs who are using it. You must keep it on the air, and make sure it is operating correctly and in the best interest of amateur radio. You cannot arbitrarily discontinue operation without angering the people who are using it. Just because a repeater is easy to build and put on the air does not mean that everyone should put up a repeater. For one thing, does your area really need an additional repeater, or are you building a repeater for prestige? Can you afford to operate a repeater? Can you afford the maintenance costs, etc., that a repeater will cause? Remember that it is best to line up financing before putting the repeater on the air rather than after. If you wait until after you may wind up paying for the repeater yourself. The authors recommend that a club be formed at the beginning to support the repeater. By doing this you will know how much interest you have and you will be assured of adequate financing.

Emergency Operation

One of the responsibilities of a repeater operator is to keep the repeater on the air during emergencies, especially during periods where there is a loss of ac power. With the equipment described in this article, this can be done easily by using the circuit shown in Fig. 3. A battery charger is trickle charging a 12 V wet cell battery of 60 Ah capacity or more. A relay connected to the ac line switches the power from the ac power supply to the battery when the ac power

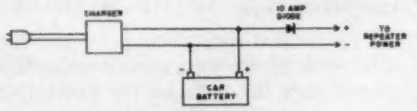


Fig. 3. Automatic emergency power, to be connected in parallel with power supply.

fails. This system provides emergency back up power and requires little care except a periodic battery water check.

Problems

If the builder follows the instructions and test procedures described in this article, few

Description	Cost	Manufacturer
Rx-144/C two meter receiver	$ 69.95	VHF Engineering
TX-144 two meter transmitter	29.95	320 Water Street
PA-144/15 15W amplifier	39.95	P.O. Box 1921
Cor-2 Carrier operated relay	19.95	Binghamton
PS-12 Power supply	69.95	New York 13902
Station Identifier (wired and tested)	39.00	Signal Systems 2537 Weston Road Colorado Springs Colorado 80910
(Above equipment purchased as VHF Engg. package.)	259.95	
(Complete rptr. kit, incl. cases and connectors, purchased as VHF Engg. package.)	364.95	
(Above complete rptr. kit, wired and tested, purchased as VHF Engg. package)	595.95	
CushCraft Ringo Antennas (2 each)	16.50	Available locally
Coaxial cable, RG8/u or T-450	.19/ft.	Hatry Electronics 500 Ledyard Street Hartford, Conn 06114

Table 2. Equipment List.

problems should be encountered. If problems are encountered, go back to the beginning, separate each component and test it individually as previously described. One problem encountered occasionally is that of intermodulation products getting into the receiver and falsely triggering the repeater. Normally this would sound like a garbled commercial service getting into the repeater. Two signals mix together producing a third frequency close to or at the repeater input frequency. Intermod is not easy to cure, let alone to find out why it is occurring. Intermod will occur infrequently on almost every repeater, such as when two mobiles from another service are very close to the repeater. If intermod occurs frequently, action must be taken. The only sure fire way to eliminate intermod which is being generated in the repeater transmitter or receiver is to eliminate off frequency signals from getting into these units. The only reliable method of doing this is to install HI-Q cavities on the receiver and transmitter, tuned to the receiver and transmitter frequencies respectively. This will take care of intermod originating at the repeater. If the intermod is occurring somewhere else and is generating a signal on your input frequency, you'll have to seek professional help.

Footnotes

1. EIA Standard RS204, Section 3.

2. General Electric Co., "Data File Bulletin," 10003-2 (June 1962), 10003-1 (July 1962).

3. Ibid., 10007-4, Figs. 9-10.

4. Ibid., p. 14.

5. ARRL, Radio Amateurs Handbook, ARRL, Newington, Conn., 1972 and later, chapter on "Interference with other Services", 'preventing radiation from the transmitter'.

Additional References on Repeaters:

Allen, G., W2FPP, "FM Repeater Installation", Ham Radio, June, 1973, p. 24.

Bilodeau, John J., W1GAN, "Homemade Duplexer for 2-meter Repeater", QST, July, 1972, p.22.

Hollar, J.S., Jr., W3JJU, "A Two-Tone Sequential Selective Calling Decoder", 73 Magazine, December, 1973, p. 8.

Olberg, S.M., W1SNN, "Two-Stage Cavity Filter for Two-Meters", Ham Radio, December, 1973, p. 23.

Singer, George, W4PPC, "Front Cover", 73 Magazine, December, 1973.

Snow, M.S., K1OXS, "A Digital Identification Unit", 73 Magazine, July, 1973, p. 39.

... W1HCI and W2EDN

GREENBELT, MD – FEB 3

FM Minifest at the Goddard Space Flight Center. Speaker, movie, prizes, free refreshments. Time: 1PM.

MANSFIELD, OH – FEB 7

The Intercity Radio Club annual auction will be held Friday, February 7th at the Naval Reserve Training Center at Ashland Road in Mansfield, Ohio. Doors open at 6:00 P.M. Look, swap, buy at 7:30 P.M. No flea fees nor commissions charged. Auction at 8:00 P.M. Eats. Donation of two dollars at door. For more information write K8JPF, 120 Homewood, Mansfield, Ohio 44906.

WHEATON, ILL – FEB 9

The Wheaton Community Radio Amateurs announce their 13th annual mid-winter hamfest on Sunday, February 9th at the DuPage County Fairgrounds, Wheaton, Illinois. Hours are 8 A.M. to 5 P.M. Tickets are $1.50 advance; $2.00 at the door. Free coffee and donuts 8:00 to 9:00 A.M. For information and advance tickets send a stamped self addressed envelope to L.O. Shaw, W9OKI, 433 S. Villa Ave., Villa Park, Ill. 60181.

LIVONIA, MICH – FEB 23

Michigan's largest, The Livonia Amateur Radio Club, will present its 5th Annual Swap and Shop on Sunday, February 23, 1975 from 10 till 4 PM at Stevenson High School in Livonia. 2m talk-in on 94 & 52.

LAPORTE, IN – FEB 23

The LaPorte ARC annual Hamfest-Auction will be held indoors at the Civic Auditorium 23 February 1975 beginning at 8 AM CST. First prize is $50.00 cash. Advance tickets are $1.00 each to LPARC, P.O. Box 30, LaPorte IN 46350. Advance table reservations also available $3.00 each. Talk-in on .01-.61 and .94 Simplex.

ROCK FALLS, ILL MAR 9

Sterling-Rock Falls Hamfest will be held March 9th. For info write Donald Van Sant, 1001 9th Ave., Rock Falls, Illinois 61071.

BERRIEN SPRINGS, MICH – MAR 15

Blossomland ARA Hamfest will be held at the Berrien Co. Youth Fairgrounds. Advance registration $1.50, $2.00 at the gate. Indoor tables $1.00. For info write BARA Hamfest, P.O. Box 175, St. Joseph, MI 49085.

WHITEWATER, WIS. MAR 16

The Tri-County ARC Midwinter Swapfest is March 16th, 9 AM to 5 PM at the National Guard Armory, Whitewater. $1.50 advance, $2 at the door (additional $1.50 reserves one displatable). Advance tickets eligible for special prize. Talk-in on 94. Refreshments, free parking, everything indoors. For tickets and details, Dan Servais, WA9AJW, Rt 4 Box 309AA, Elkhorn, Wis 53121. Tel 414-723-2227. SASE

CERTIFICATE OFFERED

The Massachusetts Chapter of the National Award Hunters Club is offering a beautiful Massachusetts Bi-Centennial certificate. For info on how to win it contact Robert Jennings W1DKD, 15 Cliff Ave., Scituate, Mass. 02066.

WORKED ALL STATES WEEK

The Radio Society of Greater Brooklyn will hold its first annual Worked All States Week Contest March 29 0001G to 2359G April 6. Winner will be the one to work all states in the shortest period of time. Anyone who works all states within the period will receive a certificate. Special certificate to the Novice who works the most states and operator working most states under most unusual conditions. Number of states only counts, not number of QSOs. Logs must include description of your station and the time, date, call and state of all stations worked. Any legal band, mode or power. Send logs to F. Grossman WB2BXO, 9519 Ave. M, Brooklyn, NY 11236.

18th ANNUAL QCWA QSO PARTY

Starts: 2400Z Friday February 7, 1975
Ends: 2400Z Sunday February 9, 1975

Activity will be within about 5 kHz from the following frequencies:

CW – 3550, 7050, 14050, 21050 & 28050.

SSB/AM – 3900, 7240, 14270, 14340, 21390, 21435 & 28600.

RTTY – 3595, 7095, 14095, 21070, 28070.

FM – 146.55 Simplex and don't overlook the repeaters.

The theme this year is Accent on the Chapters. Scoring will be computed by using the number of contacts times the number of chapters contacted times the number of QCWA Directors worked. With 69 chapters (at this writing) plus ten QCWA Directors, the scores are going to be high. Members not associated with a chapter will use "AT LARGE" instead of a chapter name. We are proud of members that belong to more than one chapter but for this contest they will please use one and only one chapter name. Each QCWAer submitting a log will provide a summary sheet with the total number of contacts, total number of multipliers and score. Repeat contacts on other bands or modes do not count for additional score.

The Houston Chapter of the Quarter Century Wireless Association is sponsoring the contest this year. The Contest Committee appointed by President Lindsey W5FR is:

Monty Montemayor W5YZ Chmn, Otho Lindsey W5FR, Jerry Sears W5AIR, C.B. Scott W5GPD, Lee Ruetz WA5RDO and Wayne Stenback W5MDV.

Your logs should be sent to W5YZ, QCWA Houston Chapter, Post Office Box 55254, Houston, Texas 77055 by March 10, 1975. See the December QCWA NEWS for further details and information.

Ham Help

This column is for those needing help in obtaining their amateur radio license.

If you are interested, send *73* your name, address and phone number. Don't be bashful – remember, it's always easier when you have someone to give you that added bit of confidence.

73 would appreciate amateurs and clubs looking this list over and helping whoever they can. Do you remember when you needed help?

James H. Genzling
512 N. Alice
Monahans TX 79756

Philip Smith
2841 E. Sherran Lane
Phoenix AZ 85016
602 956 0954

Norbert Adsit
29025 Yorkshire
Warren MI 48093

Clegg

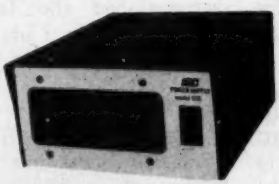
THE 2-METER LINE

- 146-148 MHz
- 25 WATTS OUTPUT
- CRYSTIPLEXER CONTROL

HT-146

- 144-148 MHz
- 1.5 WATTS
- 5 CHANNELS

031 POWER SUPPLY



- 13.5 VOLTS
- 6.5 AMPS
- BUILT-IN SPEAKER

and the ALL NEW. . .

FM-DX

- AMERICAN MADE
- EXTRUDED ALUMINUM CHASSIS
- ALL MODULAR CONSTRUCTION
- ALL SOLID STATE
- SPEECH PROCESSED FM
- BUILT-IN SPEAKER
- COMPACT 10.5L x 7W x 3.25H

- 143.5 - 148.5 MHz IN DIGITALLY SYNTHESIZED 5 KHz STEPS
- 30 WATT TRANSMITTER WITH HI-LO POWER SWITCH
- MEANINGFUL, BROAD RANGE S-METER
- BRIGHT NUMERIC LED FREQUENCY READ OUT
- TRANSMITTER TRACKS RECEIVER FREQUENCY
- SUPER SENSITIVE, INTERMOD FREE RECEIVER
- ACCOMODATES ANY REPEATER SPACING

Clegg DIVISION

ISC

3050 Hempland Road
Lancaster, Pennsylvania 17601

Bill Vokac K9WQY
Box 216
Mansfield IL 61854

The Heath SB-103?

. . . Not Quite

Well. . .the "hams at Heath" have done it again! Just as I've almost completed my set of matching Heath SB gear — out comes an entirely new line (SB-104 & accessories) that puts whiskers on my SB-102 and its matching equipment.

Being a resourceful ham (translation: short of funds. . .)I figured I could update my SB-102 by adding those state-of-the-art features which obsoleted it. All I did was to compare the two rigs and make the necessary changes. What follows is a description of this conversion, which should also work on the KWM-2!

A comparison of the specifications and features of the SB-102 versus the SB-104 indicated the following features needed to be added to my SB-102:

1) solid-state circuitry
2) digital readout
3) broadbanded receiver & transmitter
4) QRP output
5) call sign light

The first two features seemed rather difficult, so I decided to work on my list from the bottom up. . .to build confidence. This technique is highly recommended as it led to the ultimate completion of all five features of the conversion!

#5 Call-sign Light

First, I selected a clear strip of Dymo label-maker tape and press-typed my call, K9WQY. Then I peeled off the self-adhesive backing and applied it in the middle of the lighted dial. I was careful to put it in the exact middle of the dial for maximum visibility during contest operation (I always seem to forget my call in the middle of a contest. . .and who cares what frequency I'm on in the heat of a contest anyway?) Having accomplished the first conversion with remarkable ease, I plunged upward through the list.

#4 QRP Output

Actually, the SB-102 was capable of QRP operation all the time. I discovered the QRP output jack on the back of the SB-102 was mis-labeled, "Driver output," Of course, then I had to use my secondary receiver and antenna to hear any replies. I considered installing a TR switch or antenna relay and using the receiver antenna jack on the rear panel of the SB-102, but I wanted to avoid any major changes in the rig to keep re-sale value high.

As it turned out, I found an even better way to QRP operation. Read on. . .

#3 Broadbanded Receiver & Transmitter

SB-102 owners have always been plagued by the "bothersome Preselector, Load, and Tune controls." (Heath catalog) The "hams at Heath" have eliminated this "problem".

This was a "toughie" until I realized. . . no controls = no tuning = **broadbanded**!

Once over this hump in logic, I began the conversion to broadbanded operation in earnest. First, I removed the following control knobs from the front panel:

1) driver tune
2) final tune
3) final load

The tuning shafts now protruded from the front panel and seemed to defy me. I

decided to hack saw them off flush with the front panel bushings for a neater appearance. To complete the job, I got some matching green-flake paint (from Heath) and covered both the front panel bushings and the end of each shaft. I made a mental note to do "something" about the panel lettering, too . . .at a later date.

I achieved a couple of unexpected benefits from this step in the conversion process, namely:

1) I no longer needed to use the "driver output" jack for QRP operation, and. . .

2) my receiver sensitivity now exceeds the reduced sensitivity of the SB-104 (<1.0 uV versus < .35 uV for 10 dB S +N/N for the SB-102). In fact, sometimes I can't even tell if the band is open.

The "SB-103." Notice the critical placement of call sign in full view of operator, and "clean look" of front panel with tuning controls eliminated.

#2 Digital Readout

Heath has had a digital frequency display, the SB-650, available for the SB-102 at a good price for some time now. A good price, that is, unless you're a "resourceful ham" like myself.

First, I constructed a power supply for 8 Nixie readout tubes (I wanted one cycle resolution. . .I *never* do things halfway!). Next, I connected 8 decade switches so that I could turn on any digit in any place at will. Thus, I can "dial up" any frequency I want down to that one cycle resolution. How's that for accuracy! This really works great sitting atop the SB-102 and really impresses non-ham visitors to the shack. However, the transceiver frequency doesn't seem to follow the Nixie tube readout at all. I plan to work that out sometime.

#1 Solid-state

The first step toward solid-state was to partially integrate the circuits by bussing the fuses. Complete integration would require bussing the wires as well. At this point, however, I realized that the biggest disadvantage to my tubes in the SB-102 was the large amount of energy that was wasted in the heating of the filaments. So. . .I added a switch in my HP-23B power supply so that when I want to conserve power I just switch off the filaments. Simple, eh?

However, a couple of disadvantages to this scheme were noticed immediately:

1) the dial lights usually go out and I can't see my lighted call sign any more. . . which means I'll probably go on forgetting my call during contests, and. . .

2) signals tended to fade out rather quickly on receive, but this deficiency was offset by the transmitter becoming *truly* QRPp.

Having completed the conversion, a new model designation seemed in order. After all, my rig was no longer a "mere" SB-102. Not having all of the features of an SB-104, the "skipped over" SB-103 designation seemed to fit. Let's see, where did I put my label-maker. . .?

All is not right, however. The rig has been in use for several hours and some undesirable characteristics have appeared:

1) the "SB-103" does not work well on transmit or receive with the filaments turned off.

2) with the filaments on, I can operate high power only on 7302 kHz (which is where I was operating before the conversion).

3) no replies to my numerous transmissions have been heard as yet.

4) the green flake paint *is* flaking off.

Does anybody know how to work on an SB-103?

. . .K9WQY

C-MOS

	1–9	10 up
4000AE	$ .85	.53
4001AE	.54	.53
4002AE	.54	.53
4004AE	5.90	5.90
4006AE	3.90	3.80
4007AE	.68	.60
4008AE	3.60	3.30
4009AE	.95	.94
4010AE	.94	.94
4011AE	.54	.53
4012AE	.54	.53
4013AE	1.16	1.05
4015AE	3.70	3.25
4016AE	3.80	3.70
4016AE	1.16	1.05
4017AE	2.90	2.70
4018AE	3.20	3.05
4019AE	1.30	1.20
4020AE	3.90	3.30
4021AE	3.80	3.60
4022AE	3.75	2.95
4023AE	.54	.53
4024AE	2.30	2.00
4026AE	.84	.80
4026AE	9.80	7.10
4027AE	1.38	1.22
4028AE	2.95	2.75
4029AE	5.40	4.80
4030AE	1.25	1.05
4035AE	2.85	2.80
4040AE	4.80	4.40
4041AE	3.30	3.20
4042AE	2.95	2.85
4043AE	2.95	2.85
4044AE	2.95	2.85
4047AE	3.70	3.60
4048AE	1.50	1.40
4049AE	1.35	1.05
4050AE	1.35	1.05
4066AE	3.50	3.40
4068AE	6.30	4.80
4066AE	3.20	2.96
4069AE	.65	.75

Waveform Generator Kit

XR205K Only $28.00

Here's a highly versatile lab instrument at a fraction of the cost of conventional unit. Kit includes two XR205 IC's, data & applications, PC board (etched & drilled, ready for assembly) and detailed instructions.

Digital Watch

with liquid crystal display. Beautiful, reliable and accurate. $149.00 plus $2.50 for shipping and handling.

$7.90

9-Digit Display

- 1/8" character height
- compact, thin PC package
- wide viewing angle

LED's

.125"dia.

209	Red	$ .25
209	Yellow	.35
209	Green	.35

.160"dia.

216	Red	.25
216	Yellow	.30
216	Green	.30

.200"dia.

220	Red	.25
220	Yellow	.30
220	Green	.30

LOW PROFILE

226	Red	$ .25
226	Yellow	.30
226	Green	.30
226	Orange	.30

Displays

SLA1	Red	$2.25
SLA11	Green	4.25
SLA21	Orange	4.25
SLA2	2:1 Red	2.25
SLA12	2:1 Grn	2.25
SLA22	2:1 Org	2.25
SLA3	Red	7.50
SLA4	Red	7.90
XAN72	Red	2.50
XAN52	Green	2.50

Optoisolator

MCT2 1.45

MV50 Red $ .30

5083	Red	$ .35
5083	Yellow	.40
5083	Green	.40
5083	Orange	.40

216 = MV5024
5083 = MV5053

Audio Amps

LM382: 6-15V, 1.15W, 8Ω	1.60
LM384A: 6-27V, 2.80W, 8Ω	2.50
TAA611B12: 6-15V, 1.15W, 8Ω	1.60
TAA621A12: 6-27V, 1.40W, 8Ω	2.00
TBA641B1: 6-18V, 2.20W, 4Ω	3.90
TBA800: 5-30V, 4.70W, 8Ω	2.20
TBA810AS: 6-20V, 2.50W, 4Ω	3.00
TBA820: 3-16V, 0.70W, 4Ω	1.70
TCA830: 5-20V, 2.00W, 4Ω	2.25
TCA940: 6-24V, 6.50W, 8Ω	4.40

DUAL LOW NOISE OP AMP

LM331N:
V_{IO} = 6mV
I_{IB} = 100nA
I_O = 2000nA
Noise = 1.5dB
$2.20

Memories

P1101A	$6.90
P1101A1	8.90
P1402A	7.90
P2102	18.00
P3101	8.50
P2101A	5.50
MM5560N	8.00
MM5661N	8.90
DM8899N	8.90
93403	8.00

FM Stereo Demodulator

XR1310 $3.90

HYBRID POWER AMPLIFIERS

SI-1010C	10W	$	6.90
SI-1020C	20W		9.90
SI-1030C	30W		18.70
SI-1060C	60W		26.90

Power Transistors

BU204	3A	1300V	$4.14
BU208	3A	1500V	4.95
BU208	3A	1700V	5.94
BU207	6A	1300V	5.85
BU208	6A	1500V	6.93
BU209	6A	1700V	8.64

Decoded Read Write RAM

P1103 $6.20

Voltage Regulators

LM100H	$ 5.50
LM104H	5.50
LM105H	5.10
LM105F	9.50
LM109H	9.50
LM109K	6.30
LM200H	3.90
LM204H	4.70
LM205H	3.00
LM209H	3.80
LM209K	3.70
LM300H	.90
LM300N	1.40
LM304H	1.40
LM306H	1.10
LM305AH	1.40
LM306N	1.20
LM308H	1.75
LM309K	1.95
LM340-05K	2.60
LM340-06K	2.60
LM340-08K	2.60
LM340-12K	2.60
LM340-15K	2.60
LM340-18K	2.60
LM340-24K	2.60
LM723H	1.30
LM723D	3.90
LM723CH	.80
LM723CN	.75
L129	1.50
L130	1.50
L131	1.50
SG4601T	2.20
SG4601N	2.20

Linear IC's

LM114H	TO-5	$ 3.00
LM301A	TO-5	.90
LM301AM	Mini-dip	.75
LM301AN	Dip	1.10
LM302H	TO-5	.95
LM302N	Dip	1.40
LM306H	TO-5	2.80
LM307H	TO-5	.90
LM307M	Mini-dip	.90
LM308H	TO-5	1.20
LM308AH	TO-5	1.50
LM310H	TO-5	1.40
LM311H	TO-5	1.70
LM318H	TO-5	2.50
LM555CM	Mini-dip	.90
LM709CH	TO-5	.45
LM709CN	Dip	.45
LM710CH	TO-5	.60
LM710CN	Dip	.75
LM715CH	TO-5	4.30
LM725CH	TO-5	5.00
LM733CH	TO-5	1.50
LM733CN	Dip	1.50
LM741CH	TO-5	.45
LM741CM	Mini-dip	.44
LM747CH	TO-5	1.95
LM747CN	Dip	.90
LM748CN	Dip	.40
LM3046CN	Dip	.95
LM3900N	Dip	1.50

Phase Locked Loops

LM567CM Mini-dip 2.10

IC Power Regulators

LM335K: 6V, 600mA	2.40
LM336K: 12V, 500mA	2.90
LM337K: 15V, 460mA	2.90

PREMIUM QUALITY COMPONENTS

We've been buying and selling top quality components for nearly ten years. Our annual volume exceeds $3 million. We handle only original parts, from the world's leading manufacturers and our customers include some of the largest and most quality-conscious companies.

Now you can take advantage of our component buying skills and power and select from a broad range of advanced circuits.

FIRST GRADE QUALITY GUARANTEED

IC sockets

Solder

8 pin DIL	.22	3 pin TO-5	.55
14 pin DIL	.26	4 pin TO-5	.65
16 pin DIL	.29	6 pin TO-5	.90
24 pin DIL	.75	10 pin TO-5	1.10
28 pin DIL	1.10		1.40
36 pin DIL	1.70		
40 pin DIL	1.90		

Teflon

14 pin DIL	.45
16 pin DIL	.45

Wire Wrap

1024 Bit N-Channel RAM

2602B	$21.00
2602-1B	25.00
7552CPE	21.00
7552-1CPE	25.00

Schottky TTL

SN74S00N	$ .80	74S00N	$ .16	74H00H TTL		74H50N	$ 1.14
SN74S02N	.80	74S01N	.23	74H01N	.75		
SN74S03N	.80	74S02N	.22	74H74N	.38	74H51N	.75
SN74S04N	.80	74S03N	.32	74H78N	$ .88	74H53N	3.25
SN74S08N	.80	74S04N	.25	74H76N	.99	74H54N	1.12
SN74S10N	.80	74S05N	.29	74H80N	.68	74H55N	1.63
SN74S11N	.80	74S08N	.38	74H11N	1.21	74H56N	1.49
SN74S20N	.80	74S10N	.48	74H82N	1.01	74H57N	1.49
SN74S22N	.80	74S11N	.24	74H83N	1.01	74H58N	1.19
SN74S40N	.80	74S20N	.54	74H84N	3.01	74H60N	1.54
SN74S41N	.80	74S22N	.70	74H85N	2.49	74H61N	1.90
SN74S64N	.80	74S30N	.29	74H86N	.49	74H62N	1.35
SN74S74N	1.90	74S32N	.70	74H87N	2.90	74H63N	1.50
SN74S85N	6.10	74S37N	.29	74H88N	.49	74H72N	1.50
SN74S86N	.99	74S38N	.29	74H89N	.75	74H73N	1.99
SN74S112N	2.50						
SN74S113N	1.50	74S40N	.29	74H90N	.91	74H74N	1.99
SN74S133N	1.00	74S51N	.29	74H91N	1.40	74H76N	1.89
SN74S136N	4.50	74S64N	.32	74H92N	.84	74H78N	1.99
SN74S138N	3.90	74S74N	.32	74H93N	1.40	74H101N	2.95
SN74S140N	1.00	74S86N	.25	74H94N	.99	74H103N	2.95
SN74S151N	3.30	74S112N	.29	74H95N	1.40	74H106N	2.39
SN74S153N	3.30	74S113N	.29	74H96N	1.40	74H107N	2.39
SN74S154N	3.40	74S114N	.29	74H97N	1.40	74H108N	2.39
SN74S157N	2.70	74S124N	.29	74H98N	1.40	74H109N	2.39
SN74S158N	3.00	74S132N	.54	74H99N	1.40	74H111N	2.39
SN74S160N	6.60	74S133N	.29	74H100N	1.40	74H112N	2.39
SN74S161N	6.60	74S134N	.29	74H101N	1.40	74H113N	2.39
SN74S174N	4.75	74S135N	.29	74H102N	1.40	74H114N	2.39
SN74S175N	4.00	74S136N	.29	74H103N	1.40	74H115N	2.39
SN74S181N	11.50	74S138N	.29	74H104N	1.40	74H116N	2.39
SN74S189N	5.10	74S139N	.29	74H105N	1.40	74H117N	2.39
SN74S194N	3.30	74S140N	.29	74H106N	1.40	74H118N	2.39
SN74S195N	4.40	74S151N	.29	74H107N	1.40	74H119N	2.39
SN74S251N	4.20	74S153N	.29	74H108N	1.40	74H120N	2.39
SN74S253N	4.20	74S157N	.29	74H109N	1.40	74H121N	2.39
SN74S278N	3.20	74S158N	.29	74H110N	1.40	74H122N	2.39
SN74S288N	3.70	74S160N	.29	74H111N	1.40	74H123N	2.39
SN74S289N	.90	74S161N	.29	74H112N	1.40	74H124N	2.39
SN74S299N	5.70	74S162N	.29	74H113N	1.40	74H125N	2.39
SN74S399N	5.00	74S163N	.29	74H114N	1.40	74H126N	2.39
93S10	6.80	74S174N	.29	74H115N	1.40	74H128N	2.39
93S16	6.80	74S175N	.29	74H116N	1.40	74H130N	2.39
93S21	3.80	74S181N	.29	74H117N	1.40	74H131N	2.39
93S22	3.20	74S182N	.29	74H118N	1.40	74H132N	2.39
93S48	3.70	74S189N	.29	74H119N	1.40	74H133N	2.39
		74S194N	.29	74H120N	1.40	74H134N	2.39
		74S195N	.29	74H121N	1.40	74H135N	2.39
		74S251N	.29	74H122N	1.40	74H136N	2.39
		74S253N	.29	74H123N	1.40	74H137N	2.39
		74S257N	.29	74H124N	1.40	74H138N	2.39
		74S258N	.29	74H125N	1.40	74H139N	2.39
		74S260N	.29	74H126N	1.40	74H140N	2.39
		74S273N	.29	74H128N	1.40	74H141N	2.39
		74S274N	.29	74H130N	1.40	74H142N	2.39
		74S275N	.29	74H131N	1.40	74H143N	2.39
		74S276N	.29	74H132N	1.40	74H144N	2.39
		74S280N	.29	74H133N	1.40	74H145N	2.39
		74S287N	.29	74H134N	1.40	74H146N	2.39
		74S288N	.29	74H135N	1.40	74H147N	2.39
		74S289N	.29	74H136N	1.40	74H148N	2.39
		74S299N	.29	74H137N	1.40	74H149N	2.39
		74S399N	.29	74H138N	1.40	74H150N	2.39
				74H139N	1.40	74H151N	2.39
				74H140N	1.40	74H152N	2.39
				74H141N	1.40	74H153N	2.39
				74H142N	1.40	74H154N	2.39
				74H143N	1.40	74H155N	2.39
				74H144N	1.40	74H156N	2.39
				74H145N	1.40	74H157N	2.39
				74H146N	1.40	74H158N	2.39
				74H147N	2.95	74H159N	2.39
				74H148N	3.95	74H160N	2.39
				74H149N	3.95	74H161N	2.39
				74H150N	3.95

E.H. Sommerfield W2FJT
49 Spring Road
Poughkeepsie NY 12601

Get Into a Grey Mood - Generate

Modification of the ROBOT Research Inc. Model 80-A SSTV Camera for Grey Scale Generation

A grey scale generator generates frequencies ascending, or descending, between 1500Hz (black) to 2300Hz (white). This spectrum enables the SSTV receiving operator to adjust his/her display brightness and contrast controls for a linear white to black display.

Sophisticated digital timing chains driving digital-to-analog converters, which in turn, drive a VCO (Voltage Controlled Oscillator) through 4 to 16 discrete frequencies (levels of brightness) can be found in the SSTV Handbook published by 73 Magazine. This article describes an alternative method that generates linear, rather than discrete, levels of brightness. Although a linear display may not be considered sophisticated enough for the idealist, I have found a linear display sufficient for the application; and the $3.75 price tag can't be beat!

Design Considerations

The only constraint placed upon the design was that no modifications be made to the 80-A circuit board. This was done mainly to insure that the board could always be returned to ROBOT on an exchange basis, for an improved one necessitated by engineering changes.

The design is based upon the statement made by ROBOT on page 8, paragraph 3 of their instruction manual. "Maximum video excursion is limited such that whites do not produce frequencies above 2300Hz nor blacks below 1500Hz." This is accomplished electrically by the clamping action of the collector to base diode action of Q4 and Q5.

The design described in this article is based upon the fact that if the video excursion can be forced, safely, between these limits, then a 1500Hz to 2300Hz, grey scale will be generated.

A forcing signal can only be applied externally to the clamped video line safely at pin "S." If the signal is applied at either pins "R" or "K," there is the chance that it will be applied directly to the output of U12, if S2 is in the reverse position, and damage U12. Depending on the normal bias levels at the emitter of Q3 (set by the brightness control) it will require about ±0.3mA to drive the video line to the clamped limits. This value could be as high as +3.3mA at the lowest brightness extreme, but this is not the normal operational range. The forcing signal is not applied during non-grey scale operation, so as not to deteriorate the existing video levels.

Circuit Description of Modification

The schematic is shown in Fig. 1. The horizontal deflection voltage, a sawtooth signal, approximately ±3V centered about ground, is applied to an emitter follower via a variable signal attenuation network mr1, mr2. This signal is applied, via msw1-A, to the clamped video line when msw1 is turned to the "SCALE" position. When msw1 is in this position, the contrast voltage is reduced to near zero by mr6. mr6 limits the discharge current to 20mA maximum when msw1 is turned to "SCALE." A separate "Brightness" voltage, determined by mr7, mr8, is applied to the video clamp line via MSW1-C and pin "V." It is, therefore, possible to set both the bias level via mr8,

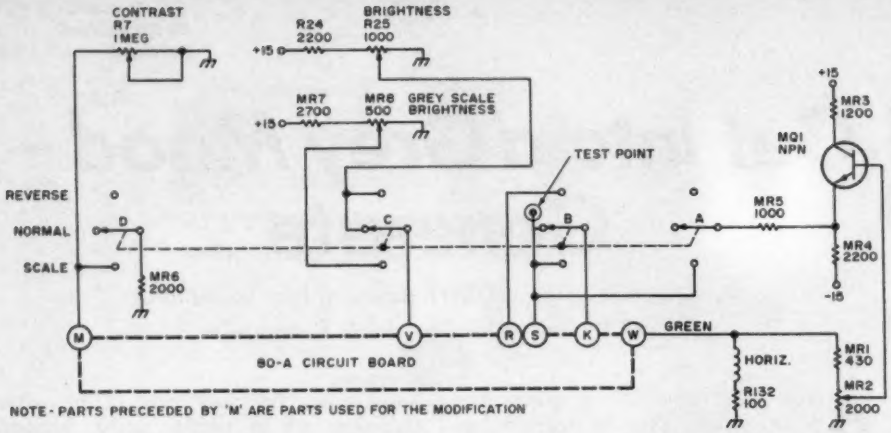


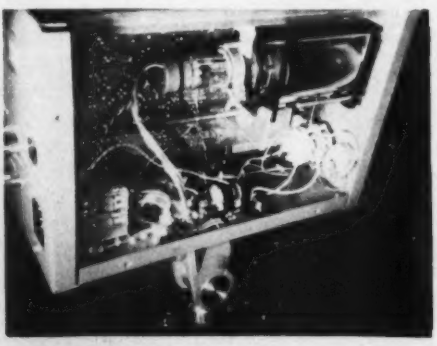
Fig. 1. Modifications to the Robot Research SSTV camera Model 80-A to provide "Grey Scale" generation.

and signal level via mr2, to force the clamped video line to both + and - clamped levels in the absence of any vidicon signals (mr6). Since this is done via the horizontal drive signal, a line is displayed starting with white, -.6 clamp voltage, and ending with black, +.6 clamp voltage. The settings of the "SCALE" signals do not affect normal brightness and contrast settings.

Physical Modifications

S2 was replaced by a 4-pole 3-position rotary switch. All components except mr6 were placed upon a 5.08cm x 5.08cm (2" x 2") vector board and mounted, via a .95cm (3/8") spacer and a 2.54cm (1") 6/32 bolt inserted through one of the holes of the tripod mount base plate.

+15V is located on one of the solder terminal strips, and -15V is located on pin 6 of the power plug.



Looking at the photograph, the two trimmer pots are located in the center of the board and the transistor is located in the lower right corner of the board. Notice the new 4-pole rotary switch at the right side of the photo.

Adjustment

With an oscilloscope at test point "T" (Fig. 1) on the clamped video line, adjust mr2 and mr8 for maximum signal such that the positive and negative peaks just begin to show signs of clipping.

Conclusion

The linear circuit is far less expensive, and much easier to implement and adjust than the discrete circuit.

I have adjusted Slow Scan displays using both discrete step and the linear signals with little difference in the end result.

Parts List

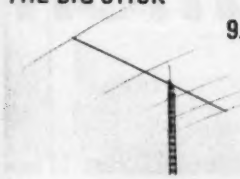
mq1 – General purpose NPN silicon 12V transistor "CALECTRO K4-506" ½ watt. Lafayette.
mr1 – 430Ω 1/2 W 10%
mr2 – 2000Ω 1/10 W 100 V Linear Sub-Min Trimmer CALECTRO B1-643. Lafayette.
mr3 – 1200Ω 1/2 W 10%
mr4 – 2200Ω 1/2 W 10%
mr5 – 1000Ω 1/2 W 10%
mr6 – 2000Ω 1/2 W 10%
mr7 – 2700Ω 1/2W 10%
mr8 – 500Ω 1/10 W 100 V Linear Sub-Min. Trimmer CALECTRO B1-642. Lafayette.
msw-1 – 4 pole 3 Position Non-shorting Rotary Switch.

... W2FJT

THE SMART HAMS ARE CATCHING ON KLM PRODUCTS

DO GIVE YOU THE EDGE!

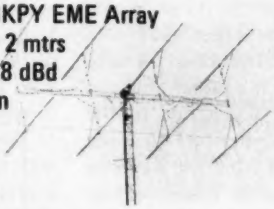
THE BIG STICK



9.7 dbd gain

5EL 20 mtr. mono bander
KLM 13.9-14.4-5

W8KPY EME Array
for 2 mtrs
23.8 dBd
gain



8 KLM 16EL 2 MTR
ANTENNAS (KLM 144-148-16)

10 WATTS IN

2mtr Amplifier
PA 10-140B

140 WATTS OUT

KLM 140-150-12C

2 MTR CIRCULARLY
POLARIZED
OSCAR
ANTENNA

Write for complete catalog or check with KLM's growing list of distinguished dealers.

KLM ELECTRONICS

1600 Decker • San Martin, California 95046
408) 683-4240

NEW DEALERS

Bratty Communications
2198 Colvin Blvd.
Tonewanda NY 14150

Identicorporation
16 East 52nd Street
New York City NY 10022

J. H. Electronics
254 Captains Drive
Babylon NY 11704

D. B. Griffin and Assoc Ltd.
So. 5189 Bussendorfer Road
Hamburg NY 14075

OHIO

Challenger Electronics
1700 Central Avenue
Middletown OH 45042

Communications World
4788 State Road
Cleveland OH 44109

Queen City Electronics
1583 McMakin Avenue
Cincinnati OH 45231

Kelly Scheinberg
7379 Calmcrest Street
Dayton OH 45424

OKLAHOMA

Cals Radio
3rd & Davis
P. O. Drawer F
Tipron OK 73570

Larry M. Dillard WB5CWB
2624 SW 69 Street
Oklahoma City OK

PENNSYLVANIA

Hamtronics
4033 Brownville Road
Trevose PA 19047

TEXAS

J. P. AshCraft
5641 Dyer Street
Dallas TX 75206

Trimble Electronics
1918 Mary Ellen
Pampa TX 79065

Kennedy Associates
2618 Rigsby Avenue
San Antonio TX 78222

OTHERS

Stereo City Inc.
481 Highland Avenue
Augusta GA 30904

Preston Electronics
611 Highland Drive
Houma LA 70360

Ray Liby
2112 So. Burdick
Kalamazoo MI 49001

Multitone Electronics Inc.
One Cornell Parkway
Springfield NJ 07081

Juniper Photo Electronics
2648 SW 25th Street
Redmond OR 97756

FOREIGN

Ing. Hans Schulze Ltd
P.O. Box 4155
San Jose, Costa Rica

Gemini Electronics Ltd
P. O. Box 5889
Auckland, New Zealand

Electronics Fernandez
208 Eleanor Roosevelt Street
Hato Rey, Puerto Rico 00918

West Indies Sales Co.
606 Calle Abey
San Juan, Puerto Rico 00907

Omnicom
Hinterrotteweg 15
Switzerland

William P. Turner WAØABI
5 Chestnut Court
Saint Peters MO 63376

Instant Neutralization

The following, while intended to apply specifically to a Heath SB-110A, would be equally applicable to other gear containing similar circuitry. The SB-110A final and driver neutralization is a rather long and involved process not so much due to the electronics, but rather to the fact that the screen voltage is removed from the stages to be neutralized by alternately removing two resistors from feedthrough capacitor "AU." The time and effort involved may be reduced to a fraction of normal if a switch is installed under the chassis. This switch connects either or both of the before-mentioned leads to the feedthrough and allows instant changeover during neutralization.

The switch is mounted in the "driver shield," immediately below the driver tuning capacitor, with the shaft/knob in line with the shaft of the "mode" switch. The resistor leads involved will reach this point without difficulty and only a very short length of wire is needed from the switch common to the feedthrough.

There are two types of switches which will work in this modification, the most common being a "rear seat speaker switch" of the front-back-both variety. A double pole, three position switch will do as well, but it is a little more expensive.

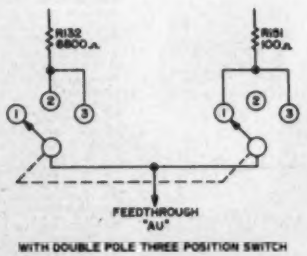


Fig. 1. Feedthrough "AU" with double pole three position switch.

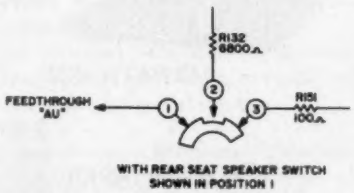
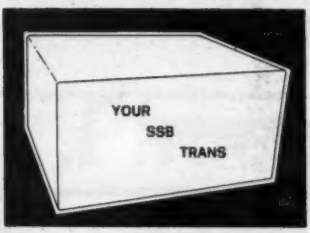


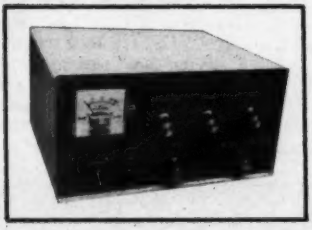
Fig. 2. Feedthrough "AU" with rear seat speaker switch shown in position 1.

In the examples, position 1 removes screen voltage from the driver allowing neutralization of that stage. Position two reconnects the driver and removes the final screen voltage for similar purposes. Position three restores the connections and the rig to normal operation.

... WAØABI



PLUS



EQUALS

160 meters

AND---

160-meters is fun, and it's easy besides when your equipment comes from Dentron.

master charge

BANKAMERICARD

Here's a REAL plus

You will add a real plus to your SSB station when you give it complete 160-meter receive and transmit capability with the exciting new Dentron 160 XV Transverter. Just two simple connections with no modifications and you're on the air.

- 5 watts drive gives 100 watts DC input — full overload protection
- 3.8 to 4.0 MHz input
- Matches 50 ohm antenna
- Built in 110/220 V 50/60 Hz supply
- **Units are available for the 2 MHz MARS Frequency.**

Dentron 160 XV Transverter

$199.50 ppd. USA

plus even more!

Let the Dentron 160 AT antenna tuner solve your 160-meter antenna problems the easy uncomplicated way. This transmatch will load any random length antenna from a short whip to an extra-long wire. Use it with virtually any existing HF antenna you already have. Handles maximum legal power. Use with the 160-XV or any other 160 meter equipment requiring a 52 ohm antenna.

Dentron 160 AT Antenna Tuner

$49.95 ppd. USA

DenTron

27587 Edgepark Dr.
North Olmsted, Ohio 44070
Telephone (216) 734-7388

introducing

MODEL 4 X 6

250 MHZ FREQUENCY COUNTER

250 MHz for $1.00 per MHz

$250

MODEL 4 x 6 WIRED and TESTED

Include $2.50 to cover Postage and Insurance

Price FOB Shawnee, Oklahoma

SPECIFICATIONS

Frequency Range	500 kHz – 250 MHz
Sensitivity	Less than 80 mV at 150 MHz
Input Z	50 ohms
Max. Input Voltage	15 V rms, 50 V dc
Time Base	Crystal Clock plus-minus 10 ppm 0°C to 40°C ambient
Readout	6 Digit 7 Segment LED
Power	120 V ac
Dimensions	2¼" H, 10" L, 7" D
Cabinet	Light blue

K-ENTERPRISES

1401 NORTH TUCKER • SHAWNEE, OKLAHOMA 74801

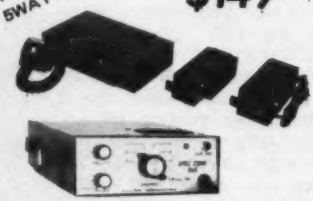
new! THE "EXPANDABLE" 2M FM 5WATT TRANSCEIVER

SPEC COMM

KNOCKS THE WIND OUT OF INFLATION!

SPEC COMM 560

$149.95



OPTIONAL ACCESSORIES

- ☐ "Clip-On" rechargable 1.2 AH battery module, w/ carrying strap, 18" antenna, & charger. BP-1 $55.95
- ☐ "Clip-On" 25 Watt Amp./ lo noise receiver preamp module. BA-1 $79.95
- ☐ "Clip-On" AC Power Supply module, AC-1 $44.95
- ☐ Mobile Mounting Bracket, MB-1 $7.95
- ☐ Modification Kit to expand SC560 to 12 channels

COMING SOON

- ☐ Unique compact companion synthesizer
- ☐ External mobile/fixed speaker

SC560 SHOWN WITH ACCESSORIES

FULLY WIRED AND TESTED-NOT A KIT

(MADE IN USA – 90 DAY WARRENTY)

- ☐ 5 Watts RF Output
- ☐ 6 Channels
- ☐ Excellent Quality Modulation
- ☐ Electronic T/R Switching
- ☐ Compact Modules provide Versatile, expandable performance

JOIN THE FUN ON 2! USE THE SC560 MOBILE, FIXED OR OVER THE SHOULDER

- ☐ 0.6 uV for 20 dB Qt. Sens. (typ.)
- ☐ 14 kHz B.W., 6 pole xtal filter
- ☐ Bal. Mxr. for superior I.M. performance
- ☐ Built in 3" Speaker
- ☐ 146.52 xtals included
- ☐ Size: 2¼ x 6 x 8"

See Nov 73 Mag for more details – Write for club offer

ORDER TODAY – DIRECT FROM THE FACTORY

Include Shipping & Handling $2.50

(PA residents add 6% tax)

SPECTRUM COMMUNICATIONS

BOX 140, WORCESTER PA 19490

215-584-6469

Send for Spec Sheet

Martin W. Krey K7NZA
7037 East Chaparral Road
Scottsdale AZ 85253

Phoenix Hams Show How It's Done

Ham radio was on the spot before the eyes of the world out in Arizona in mid-September, and twenty five Scottsdale area hams from five clubs in the Valley of the Sun opened up the eyes of the world to the possibility of using radio to link together the six hundred members of Sister Cities International in sixty five foreign countries and the U.S.A. They did it in spite of considerable adversity.

Sister Cities International has been called a "good will people-to-people program" whose aim is to make life better by promoting international peace and understanding through having cities in different parts of the world pair off and work together on each other's problems.

Hams from the Scottsdale, Phoenix, and Arizona Radio Clubs joined those from the Arizona Repeater Assn. and Bash-Hal-Ne-Ae and accepted a challenge from Sister Cities to rig up a temporary demonstration station at famed Mountain Shadows Resort for nearly five hundred convention delegates. The event was the sixteenth annual international convention, meeting under the banner of "Communicating for World Peace."

The whole thing got started on Wednesday, September 18, when the five hundred delegates blew into Paradise Valley, just north of Phoenix. Were it not for the sturdy and sumptuous quarters in which they were lodged, they would have been blown right back out again by the niftiest patchwork of intermittent storms to flash through the area in many months. Strong winds drove delegates indoors, while sheets of rain whipped under the covered walkways and jagged lightning walked around the mountain tops.

One puffing delegate from the Midwest said, "My gosh, this is the arid Southwest? Every time I poke my head out of the meeting room, I see ugly clouds, rain and lightning."

For the hams, things began several days earlier when they wheeled into the hotel parking lot with a pickup truck laden with personal and borrowed gear. Ex-Navy airplane jockey Tom Moore, W7FCQ, was ram-rodding, having taken over from Bill Eccles K7MJC, who had planned the ham end of the project some six months before. It was Tom's job to set up the equipment and erect two antennas on the roof of Flirtation Walk, leading in from the resort's tennis court and golf course. He had earlier gotten permission from the FCC to operate with the mysterious call, WH7SCI.

Given his choice of station locations, Tom had the gear set up right outside the door of the elegant Navajo Room, where the delegates would confer. The spot was on the hotel end of Flirtation Walk, under the roof, but protected on the back and sides only by shrubs and a fence. Under normal Arizona conditions, the site would have been superb, but nobody figured on the rain.

"We knew about the bad weather conditions coming," Tom said, "and we figured that wind would be our biggest problem, so

Sometimes everybody forgets the same thing – in this case an identification sign – so Gene Hubbel W7DI whomped one out on the spot and hung it up for the 500 delegates of the 16th International Convention of Sister Cities to see.

we prepared for that. But it was the rain that nearly got us."

To handle the wind, Tom used new 2000-pound-test nylon ropes on the old style three-element Mosley Jr. beam that the antenna crew hoisted up onto the roof. A Bassett trap inverted V was strung up for 75 and 40 meters, and a portable Hy-Gain Yagi beam was put up under the roof for the little 2-meter rig. All three antennas weathered the coming storm with no trouble.

Jean Murphy, head of the hotel catering service, provided two heavy tables for the rigs. Then she won over all of the hams by covering the tables with linen tablecloths before the rigs were put in place.

"The XYL ought to get a load of this!" said one ham who apparently was having a little trouble at home.

The hams hooked up a Collins 75S-3C, a 32S-3, and a 30S-1 amplifier, all borrowed from Barry Goldwater, and the Scottsdale Radio Club brought a Drake TR4 transceiver. Gene Hubbel W7DI provided a Swan Signet transceiver, and others brought keys, mikes, connectors, and handy lengths of co-axial cable. Everything was carefully and properly hooked up by Tuesday evening, Sept. 17, and with a bevy of curious onlookers gathered around, the big switch was thrown. Nothing happened – at least not in the big rig. Voltages were down 50 per cent and the time delay in the plate circuit wouldn't even come on in the 30S-1.

With several hundred years of combined experience in radio on the spot, no problem remained a mystery for long.

"We just hadn't talked the same language as the hotel engineer," said Tom Moore later. "We had asked for 220 volts, and he gave us just that – with one side grounded. We hadn't told him we had a splitter in the transmitter."

Once the trouble was known, Dean Mendel, the hotel engineer, gave the hams 220 with a common from a box on the lawn, and WH7SCI was on the air testing as K7MJC/7, until their allotted time began on Wednesday. Running barefoot to the east coast, they got a 20 over 9 report from Tom Azzara W2LFB in Nutley, N.J.

But troubles never come singly, and the station was just beginning to get a rhythm to its calls when something happened to the power. It was being drained off as though in a science fiction movie. This problem, too, was quickly located, but it was not solved. Somebody noticed that the hotel swimming pool area was fiercely aglow with lights. A local Cadillac company had rolled in a whole convoy of new cars and spotted them around the swimming pool and on every available flat spot on the lawn for the viewing of a throng of guests that number in the thousands. Each vehicle was brilliantly spotlighted so that gowned ladies and their smartly dressed escorts could view plush interiors and peek under hoods without spilling their martinis.

At 5:40 p.m., somebody decided that WH7SCI was still drawing too much power, and they pulled the plug on the station completely. Nobody minded too much since the convention hadn't yet begun, and forecasters were beginning to say nasty things about the evening weather. On their way home, the hams went past the auto show and bumped into a worried Jean Murphy, the thoughtful cateress.

"I just told the head Cadillac man that it was going to rain and ruin his whole show," she said, looking up at the sky, "and he told me, 'Don't worry, God drives a Cadillac, and He won't let it rain on these.' "

And He didn't.

Back on the air at 5:00 a.m. Wednesday,

the hams found conditions spotty, just as amateur radio publications had predicted they would be. The day had dawned cloudy, and action on the rigs and around the station didn't get heavy until nearly noon, after the delegates to the convention had registered and read the hundreds of brochures about various cities that were spread out on a thirty-foot table in the hotel lobby.

The hotel had suddenly taken on a "poster night" atmosphere like in professional hockey. "See you in Surprising San Jose" in orange day-glo jumped at you from the glass door leading to the pool, and beside it was a varicolored sign inviting you to "Rochester, the Picture City." Posters for other cities clung to the outer walls leading to the convention room.

Foothill College of Los Altos Hills, California, had prepared a fine booklet on ham radio for the convention. Entitled, "Sister Cities and Amateur Radio," the booklet covered everything from "What is Amateur Radio?" to "How to Get Your Own Amateur Station," to "A Sister City-Amateur Radio Network." Thanks to the ARRL, the booklet was illustrated with a great variety of pictures of ham operators all over the world and told of the function and value of the Medical Amateur Radio Countil and other radio and emergency networks. The booklet was given to all delegates to the convention, and since Wednesday was a light day in their schedule, many delegates must have read it.

A steady stream of people from all over the world began showing up to watch WH7SCI being operated. As a rule, they hung back and tried to figure the thing out by themselves. Fortunately, there were enough hams on hand to do a little public relations work, and they introduced themselves and told in simple terms how ham radio functioned. Almost all of the delegates, regardless of what point of the globe they hailed from, could speak English, and some of them came back several times, each time adding to their understanding of amateur radio.

A delegate from Cavite in the Phillipines asked Gene Hubbel W7DI if he could put him in touch with his government. But propagation was so poor out of state that Gene had to tell him the job could be done, but it would take a little time.

The station operators had hoped to try some delegate-to-home hookups, but conditions remained so spotty that they hated to build up any delegate's hopes.

About noon, massive clouds that had been hanging around the Valley lumbered in ominously for a convention of their own. As though on signal, lightning began leaping among the clouds and striking out for the higher mountains. Thunder ripped through the Valley, and the sky opened up right over the hotel and its radio station. And then the wind came up, driving every single delegate indoors, and leaving nobody but the determined hams out in the slanting rain.

Bob Johnson W7JTL was on the air when the storm hit, and Tom Moore and Gene Hubbel were talking to delegates. Bob hunched over the radio gear, which was safely back against the wall of the hotel, and Tom and Gene watched in disbelief as the rain poured off the roof.

"What worried us most," said Tom, "was a downspout that somebody had boresighted right straight at the lawn box from which we were drawing our power. Water gushed all over that box, and why it didn't blow a circuit breaker, I'll never know."

Tom Moore W7FCQ and his antenna crew drilled a mast hole in a 2 x 4 nailed to a half sheet of plywood, laid it down for the butt end of the mast, and hoisted the Mosley tri-bander into position on the roof of famed Mountain Shadows' Flirtation Walk. Cinched to the cross members of the roof with heavy nylon ropes, the beam easily weathered high winds and torrential rains.

Gary Chinn WA6WDC hunts for action on Gene Hubbel's Swan Signet while Bob Johnson W7JTL works the "big rig" borrowed from Barry Goldwater. Hams fought poor propagation and still managed 690 contacts in U.S. and 40 DX during three-day Sister Cities Convention. They missed WAS by one state – Delaware.

To make matters worse, the torrent grew in volume until the drainage system couldn't handle it. Water covered half of the concrete walk, reaching to the chairs on which the operators sat, and it flowed over the lawn and deepened until it was licking at the power box. As long as the engineer left the power on and conditions on the walk were safe, the hams were determined to keep the station on the air.

Gradually the rain stopped, and the water whisked away to lower ground. Curious delegates tip-toed around the puddles on the walk, anxious to get back to see if the hams were still there. They were, as eager and smiling as before. The antennas and all the other gear had come through the storm unscathed, and the operators had been given one more good story to tell.

When the bands fell apart at 9:14 p.m. Phoenix time, Gene Trabor W7GX had written the 208th contact into the log on 20 meters.

Phoenix mayor Tim Barrow delivered the official welcome to the Sister Cities delegates at a mid-morning session on Thursday, and set the theme for the duration of the convention when he said, "The key to resolving problems, be they local or international, is contact – communication – between and among individual human beings." Other speakers tied this idea in with amateur radio, calling attention to its accomplishments and inviting the delegates to visit WH7SCI. As a result, the band of diligent hams out on the sidewalk had a lot of company throughout the remainder of the convention.

The delegates were bussed out to the Western Town of Rawhide north of Scottsdale Thursday evening, and while they were savoring thick, delicious slabs of beef, the

hams continued to fight wind, rain, and poor propagation. A new problem developed when a couple of avid brass pounders decided to go on CW to beat the poor conditions. The big rig borrowed from Barry Goldwater wouldn't key, and it was discovered that somebody had made internal changes that made it function only on voice. Rather than stop communications to work on the transmitter, the operators decided to forego CW.

Gene Hubbel and Rick Olsen WA7CNP tried the little Swan rig on CW but discontinued it when the operators using the mike had been called into special conference by President Ford, thus delaying his departure for Phoenix. He did arrive in time to tell 900 Southwest District Kiwanians why he thinks we should go back on the gold standard, but he missed the Sister Cities Convention altogether.

Arizona Supreme Court Chief Justice Jack D.H. Hayes filled Barry's place on the program. Justice Hayes adjured the delegates to do what amateur radio operators often call out for their club members to do — involve youth in the effort to keep lines of communication open.

"Boy, you really brought 'em out of the woodwork!" kidded his partner. Then the single word "Smile" came clearly over the air. . .

at their elbow reported annoying key thumps on their receiver.

"Next time we won't hook the inverted-V onto the mast with the tri-band beam," Tom Moore said. "The antennas were just too close together."

But the brass pounders hung in there, picking off a few moments on CW whenever they could, and by the end of the convention, they had rung up a modest score of forty contacts.

Propagation, which had been spotty all day, continued that way through the evening, with conditions varying from impossible to an "everything goes" situation when the operators could make solid contact no matter in which direction they swung the beam. When the bands closed for good Thursday night, WH7SCI had scratched up another 152 contracts to make a total of 360.

Early rising delegates and hams wrinkled their brows Friday morning when they walked out around the hotel pool and cast their wary eyes upon the sky. The clouds were still there, promising rain again, and later delivering it. But it wasn't the rain that disappointed them most — it was the failure of that leaden sky to deliver a featured speaker of the convention, Senator Barry Goldwater K7UGA.

Unfortunately for the convention — and for the hams who had hoped to get the senator behind the mike for a while — Barry

"I am convinced that involvement with youth is the only way to attain lasting goals in international relations," Justice Hayes emphasized.

Youth activities were underscored with the awarding of U.S. Savings Bonds and certificates to essay contest winners across the country. The top award went to Andrew T. Oram, 16, of Jamestown, N.Y., who wrote on the theme of "How Our Community Can Celebrate America's Bicentennial Together With Our Sister City."

Meanwhile, out on the sidewalk, the hams on the mike were sending a lot of energy out into the universe, but getting very little in return. At one point, Len Ford W7AE thought he might really break 'em loose with a CQ, so he banged one out and waited. . . and waited. . .

"Boy, you really brought 'em out of the woodwork!" kidded his partner, Dave Cave WA7PBM.

Then the single word "Smile" came clearly over the air. It was a local ham who had been reading the mail and couldn't resist making the ironic rejoinder. He identified himself and later showed up to take his turn on the mike. As you might guess, his short communication brightened everything up — even the frequency — and soon the hams were popping off QSO's like they could on field day a few years back. But it didn't last. When 40 meters fell apart and the station closed at 8:34 p.m. Friday, the hams had managed a total of 91 contacts.

Saturday turned out to be the big day for both the convention delegates and WH7SCI. Delegates were kept busy all day with the annual business meeting, area studies workshops, a Town Affiliation Assn. directors meeting, and a conference reception. But the big event was the annual banquet with presentation of awards by the Reader's Digest Foundation, the sponsoring organization.

Spokane, Washington and Nishinomiya, Japan, got an award for planning and building a Japanese garden in Spokane. Portsmouth, Ohio, and Orizaba, Mexico, got an award for greater awareness and respect for each other's people. Glendale, Arizona and Delicias, Mexico, were given an award for planning, building, and learning to operate a fire truck. Glendale built it and delivered it to Delicias, and then trained the Mexican firemen to operate it. Numerous other awards were given by Kent Rhodes, president of the Reader's Digest Foundation, for such things as dramatic help, cultural exchange, and youth programs.

WH7SCI operators found propagation better than on any of the three previous days, making 279 contacts and running their convention total to 730. Most of the operators had rain paths across the shoulders of their jackets, but there was no major downpour.

A delegate from Mexico came by repeatedly to check on conditions in Honduras, where Hurricane Fifi had killed 7000 people. Late in the day, he went away relieved when the hams could tell him that the worst was over and cleanup operations had already begun. His thanks and look of relief told that he had become a believer in ham radio.

The most emphatic convert to the value of ham radio may well have been Dr. Joao Goncalves de Souza, from Brazil. Dr. Goncalves came to the station and asked Rick Olsen if he would call his home town in Brazil. (After all, hadn't the official conference program stated right on top: "The Ham Center will permit conference delegates to call their Sister Cities through amateur radio operated by experts familiar with international telecommunications systems." Why not a call to one's own city?)

Rick swung the beam and banged out a CQ. Back came a Brazilian freighter off the coast of South America, PY2BHL/portable mobile marine. The doctor talked for five minutes with the freighter's OM in his native tongue, Portuguese, he would have been very satisfied with that, but when Rick signed with the freighter, on came PY4AKZ in Brazil, forty miles from the doctor's home town. In short order, PY4AKZ clued him in on everything he wanted to know about home. Ham radio had found another believer and friend.

By the time the last Sister Cities awards were being given out, the bands were getting ragged. The end came when Ed Marple WA7KFA and Rick Olsen worked W6LUV/KV6, Frank, on Canton Island and moments later couldn't get out of town. And that's where the whole thing ended, with Jack, W7JDW, just a few miles away.

"Take her down," said Tom Moore, and fifteen minutes later all the gear except the antennas was in the back of the truck. WH7SCI had sent its mysterious call out for the last time, and hams like Al Schmidt, K9DIN, who typified hundreds of other hams would wonder no more. Al, up in Two Rivers, Wisconsin, had figured out that SCI stood for Sisters Cities International, but he had to admit, "That H in there is a new one on me." Actually, Tom Moore had asked for the H because he wanted it to do what it did – attract attention.

Doris Counts, club secretary for Bash-Hal-Ne-Ae, picked up the log books so she could send out QSL cards, and the show was over.

But the weather had the last word. The antenna crew was scheduled to have a take-down party at 10:30 a.m. Sunday, with the 73 MAGAZINE photographer on hand, but lightning had again begun its spectacular march toward Mountain Shadows Resort.

"Amateur radio is an obvious communications factor, frequently ignored until the Phoenix conference"...

Give Your Signal A
DOUBLE BOOST
And Spend More Time Communicating

1 **Let an ALPHA 374 Bandpass Linear deliver all the power you can** legally use (in any mode, continuously!) *and* eliminate the chore of amplifier tune-up, too. Using a **'374,** maximum legal power with true 'instant band change' is a reality.

2 **Add even more punch and crispness to that big signal with a** Magnum Six rf speech processor (or a DX Engineering model, if you prefer). The rugged *continuous duty* **ALPHA 374** easily handles the extra *average power* demanded by an effective rf speech processor. Buy a "no-tune-up" **'374** in February and we'll sell you an rf processor for *ONE-THIRD price*!

With *any* **ALPHA** maximum-legal-power linear you'll enjoy a new level of convenience and operating pleasure. Don't wait – see your dealer or contact ETO now for details.

The ALPHA 77D "ULTIMATE LINEAR" – latest in the fabulous ALPHA Seventy series – is now available. Call or write for information.

ETO EHRHORN TECHNOLOGICAL OPERATIONS, INC
BROOKSVILLE, FLORIDA 33512
(904) 596 3711

FREE

DATA SHEETS WITH EVERY ITEM 739/749 IC WITH EVERY $10 ORDER*

- REDUCE YOUR PROJECT COSTS
- MONEY-BACK GUARANTEE
- 24-HOUR SHIPMENT
- ALL TESTED AND GUARANTEED

- **TRANSISTORS (NPN):**

2N3563 TYPE RF Amp & Osc to 1 GHz (pl.2N918)	6/$1.00
2N3565 TYPE Gen. Purpose High Gain (TO-92/106)	6/$1.00
2N3567 TYPE High-Current Amplifier/Sw 500 mA	4/$1.00
2N3866 TYPE RF Pwr Amp 1-2 W @ 100-500 MHz	$1.50
2N3903 TYPE GP Amp & Sw to 100 mA and 30 MHz	6/$1.00
2N3904 TYPE GP Amp & Sw to 100 mA (TO-92/106)	5/$1.00
2N3919 TYPE RF Pwr Amp 3-5 W @ 3-30 MHz	$3.00
2N4274 TYPE Ultra-High Speed Switch 12 ns	4/$1.00
MPS6515 TYPE High-Gain Amplifier h_{FE} 250	3/$1.00
Assort. NPN GP TYPES, 2N3565, 2N3641, etc. (15)	$2.00
2N3638 TYPE (PNP) GP Amp & Sw to 300 mA	4/$1.00
2N4249 TYPE (PNP) Low-Noise Amp 1 μA to 50 mA	4/$1.00

- **FET's:**

N-CHANNEL (LOW-NOISE):	
2N4091 TYPE RF Amp & Switch (TO-18/106)	3/$1.00
2N4416 TYPE RF Amplifier to 450 MHz (TO-72)	2/$1.00
2N5163 TYPE Gen. Purpose Amp & Sw (TO-106)	3/$1.00
2N5486 TYPE RF Amp to 450 MHz (plastic 2N4416)	3/$1.00
E100 TYPE Low-Cost Audio Amplifier	4/$1.00
ITE4868 TYPE Ultra-Low Noise Audio Amp.	2/$1.00
TIS74 TYPE High-Speed Switch 40Ω	3/$1.00
Assort. RF & GP FET's, 2N5163, 2N5486, etc. (8)	$2.00
P-CHANNEL:	
2N4360 TYPE Gen. Purpose Amp & Sw (TO-106)	3/$1.00
E175 TYPE High-speed Switch 125Ω (TO-106)	3/$1.00

FEBRUARY SPECIALS:

2N3644 TYPE PNP TRANSISTOR GP Amp & Switch	4/$1.00
MPF102 TYPE N-CHANNEL FET RF Amp-200 MHz	3/$1.00
741 Freq. Compensated Op Amp (DIP/TO-5/MINI-DIP)	3/$1.00
1N914 or 1N4148 TYPE GP DIODE 100 V/10 mA	15/$1.00
MM5316 Digital Alarm Clock-Snooze/Alarm/Timer Hrs, Mins, Secs – with Specs/Schematics	$9.95
MM5736 6-Digit 4-Function Calculator 18 PIN DIP	$ 3.95

- **LINEAR IC's:**

308 Micro-Power Op Amp (TO-5/MINI-DIP)	$1.00
309K Voltage Regulator 5 V @ 1 A (TO-3)	$1.50
324 Quad 741 Op Amp, Compensated (DIP)	$1.90
380 2-5 Watt Audio Amplifier 34 dB (DIP)	$1.29
555X Timer 1 μs-1 hr, Dif. pinout from 555 (DIP)	$ .85
709 Popular Op Amp (DIP/TO-5)	$ .29
723 Voltage Regulator 3-30 V @ 1-250mA (DIP/TO-5)	$ .58
739 Dual Low-Noise Audio Preamp/Op Amp (DIP)	$1.00
1458 Dual 741 Op Amp (MINI-DIP)	$ .65
2556 Dual 555 Timer 1 μsec to 1 hour (DIP)	$1.55

- **DIODES:**

1N3600 TYPE Hi-Speed Sw 75 V/200 mA	6/$1.00
1N3893 TYPE RECTIFIER Stud Mount 400 V/12 A	2/$1.00
1N4608 TYPE GP & Sw 80 V/400 mA	6/$1.00
1N749 ZENER 4.3 Volt (±10%) 400 mW	4/$1.00
1N753 ZENER 6.2 Volt (±10%) 400 mW	4/$1.00
1N755 ZENER 7.5 Volt (±10%) 400 mW	4/$1.00
1N757 ZENER 9.1 Volt (±10%) 400 mW	4/$1.00
1N758 ZENER 10 Volt (±10%) 400 mW	4/$1.00
1N965 ZENER 15 Volt (±10%) 400 mW	4/$1.00
1N968 ZENER 20 Volt (±10%) 400 mW	4/$1.00
D5 VARACTOR 5-50 W Output @ 30-250 MHz, 7-70 pF	$5.00
F7 VARACTOR 1-3 W Output @ 100-500 MHz, 5-30 pF	$1.00

*MAIL NOW! FREE DATA SHEETS supplied with every item from this ad. FREE 739 or 749 Low-Noise Dual Op Amp included ($1.00 value) with every order of $10 or more, postmarked prior to 3/31/75.

ORDER TODAY—All items subject to prior sale and prices subject to change without notice.

WRITE FOR FREE CATALOG offering hundreds of semiconductors not listed here. Send 10¢ stamp.

TERMS: All orders must be prepaid. We pay postage. $1.00 handling charge on orders under $10. Calif. residents add 6% sales tax.

ADVA ELECTRONICS
BOX 4181-Y, WOODSIDE, CA 94062
Tel. (415) 851-0455

A somewhat puzzled delegate looks over operators' shoulders at WH7SCI and Tom Moore's QSL card bulletin board. Tom framed a sheet of celotex, pinned the cards up, and found that delegates were impressed by the great number of different contacts a ham station can make.

When the photograph arrived, the party was over.

"We weren't about to play games with that lightning," said Tom Moore.

All that remained was for Richard H. Oakland, Associate Director of Sister Cities International, the chief engineer of the convention, to give his appraisal.

Oakland said that the convention had achieved its three main goals: developing stronger ties between international organizations with Sister Cities objectives; finding new ways of communicating with cities throughout the world; and involving more American cities in international programs of America's Bicentennial.

"Amateur radio is an obvious communications factor, frequently ignored until the Phoenix conference," Oakland said.

In his final statement for 73 Magazine, Oakland said, "The amateur radio center operated during the Phoenix conference was highly successful. It started a lot of delegates thinking about amateur radio. The 'Center' will become a permanent fixture at our annual meetings and — as the years go by — will become much more sophisticated."

The hams can take it from there, thanks to Tom Moore and his band of twenty-five volunteers — and the guy who loaned them that heavy equipment.

... K7NZA

NEWS AS IT HAPPENS

That's just what HOTLINE gives you. Late breaking news is in your hand while it's still happening! Every other Friday, HOTLINE rushes you all the up-to-the-minute info that's so vital to the active ham. At only 30¢ an issue, it's one of the few real bargains still left! And a third of that's for postage! Just what does HOTLINE offer you?

LATEST breaking FCC news
NEW petitions filed
IMMEDIATE job openings
HOT classified ads
BRAND NEW product reports
CURRENT DXpeditions
contest NEWS
hamfest EVENTS
government ACTIONS
propagation FLASHES
everything UPCOMING
convention HAPPENINGS

The fact is HOTLINE gives you all the things you need to know when you need to know them. And that means RIGHT NOW, not two months from now. When we say "news" we mean it! HOTLINE is in the mail hours after the deadline closes, and often in your home the next day.

HOTLINE is by subscription ONLY. For $8 a year, it is delivered to you by first class mail marked "rush – time value." Our tests have shown that this class of mail often arrives sooner than even airmail! HOTLINE is published in professional newspage format and gives you many times the current information available anywhere else.

Get the news while it's still news. SUBSCRIBE TO HOTLINE TODAY!

☐ Yes! RUSH ME HOTLINE TODAY. For only $8 a year! Bill me after I receive my first issue.

Name _____ Call _____

Address _____

City _____ State _____ Zip _____

Mail today to
73 Magazine,
Peterborough NH
03458.

Nancy L. Bray WN7KUD
1424 W. Knox Street
Tucson AZ 85705

Oh, The Lost Art of Diplomacy

The following is not fiction, but for the sake of all parties involved the call signs have been omitted and the names changed. I personally witnessed the events and checked out the authenticity of the facts, statements, and circumstances which took place.

I had contacted Randy many times prior to the events.

Some years ago, Randy was told by his physicians that he could no longer fulfill his duties in the International Division of a large corporation for which he had served for well over thirty years. He knew it would be quite a blow to suddenly retire from a life that had taken him to 35 different countries throughout the world.

He was a well-thought-of junior executive (back when the dollar was one hundred cents), but his spinal disability had deteriorated beyond hope and Randy was in constant pain. Then he developed angina pectoris that could only add to his misery.

Of course retire he did, and in the first year of retirement he suffered not only physical misery but mental anguish. Randy thought if he were to remain sane he must find something to occupy his active mind. He had come up through the ranks of his company – first a technician, then a sales engineer (methods and systems), then branch manager, and finally export manager at the Washington, D.C. branch. The firm manufactures electronic office equipment; therefore he was bent many years ago toward electronics. Having been a technician and systems sales engineer, Randy had always wanted to be a ham, but now he was almost 60 and wondered if it was too late. However he decided he might be able to make it – even though he was living in his twilight years. Randy remembers that one of the first courses he took before going into sales was the Dale Carnegie course in "How to Win Friends and Influence People." Thereafter all his training dealt with human behavioral patterns. So, therefore, his friends encouraged him to try amateur radio, even though he had to go through the Novice experience at around age 60, mostly with young people. He liked young people and could bury his pride to accomplish his goal.

Randy bought a radio telegraph key and put together a code oscillator, while spending most of his time in bed – for one month he practiced code while in much pain. In addition to this, and with the help he received from the local radio club, he took the test and received his Novice license. The club straightened him out on proper timing of his self-taught code. He said it was like learning code all over again.

He then set about putting together a rig bought as a kit (Heath DX60 and HR10). He could work only twenty minutes at a time because of his affliction. He states he learned more trying to make the rig work than by putting it together. When it was finished he did many contacts, both domestic and DX,

but during his rest periods Randy tuned in on W1AW and practiced reading code for two months. When he thought he was up to about 14 to 15 words per minute, he asked his doctor about taking the General Class exam (even though he had nothing to gain band-wise), but the doctor did not approve since it meant sitting for well over his limit. Therefore he received a certificate of disability and a director of the local radio club gave him (the mail) examination for a Conditional Class.

Well, Randy made it! He doesn't know how well he did, but he remembers his shaking hand more than anything else about the code test (his spinal injury affects his entire nervous system).

Randy wasn't happy with the Conditional, because he thought other hams would look down their noses at him (and some did). So he went about improving his knowledge. I counted well over 35 ham books in the bookcase next to his bed.

He vowed he would go for a General Class even if they had to take him down in an ambulance. With 2 to 3 hours of reading each day (especially SSB), he took the chance on the one day the FCC would be in his city (only twice a year). Randy did a much better job on his General exam than on the Conditional. He made not a single mistake in code, and in theory was over 90. However, the expedition was costly in terms of the pain caused by going in for the exam. Now he is studying for the Advanced Class, but all this is not the moral of this true story.

A while ago Randy happened to be on what he thinks was someone's *private frequency?*, and so Big John bellowed in on Randy's QSO and said Randy was 12 kHz wide. At the time Randy was receiving and the other half of his QSO was transmitting. So Randy asked Big John to please stand by until his contact had completed transmitting and then he would discuss his signal with him. But Big John continued and insisted on pursuing the subject. Randy finally (his patience almost gone) said, "It sure is a mystery to me, if I am really 12 kHz wide and with SSB, and audio turned down below the flat topping point and my rig had just been returned from the factory for general adjustment." Just two weeks prior Randy had had his signal checked (on a scope) by a Navy technician, some 1500 miles away. "It is difficult ' said Randy, "to believe my one-year-old rig is really 12 kHz wide, that is so far out."

Randy's Navy contact was kind enough to allow him to adjust his audio gain and speaking distance from the microphone. He scratched a mark at the point or the position that the audio gain was not flat topping and at that point his signal was not over 3.2 kHz wide.

"Well," Big John bellowed, "I'll get witnesses." So while Randy was still in QSO with his original contact, Big John called in a few nearby ham friends and a discussion enused for some time.

Finally it became time for Randy to transmit to his contact. He mentioned what Big John had said. Randy's contact came back with a quick break, that Big John must have something wrong with his receiver or scope, because he measured Randy at 3.5 kHz wide – probably overload in the front end of his receiver. So after the QSO Randy apologized to Big John; only for the sake of peace.

Randy shrugged it off as just one of the so-called, self-appointed "police" for the ham bands. However, he vowed he would have his rig checked by the factory. At this point Randy had obtained a 550W PEP input SSB transceiver feeding a classic 33 beam forty feet up. He used mostly 15 meters. So he did send the rig back to the factory and they gave it a clean bill of health, including the ACL.

Randy decided maybe his voice did modulate heavily, so he backed away from the mike to about 8 or 9 inches with the audio gain set at a point before flat-topping and made sure his voice did not modulate the transmitter more than 150 mils, which is in accordance with the instruction book.

"One more project," said Randy, "before I get to the point where I cannot build any longer."

From a kit (IC Board) he put together a frequency marker that would calibrate 100, 50, 25, 10 and 5 kHz. Then he beat the marker with WWV three times to make

certain it was correct before the new incentive license change on November 22, 1969. In checking with other hams he found he was never more than a few cycles off (and maybe the other fellow was out) and these checks were with top-notch operators and equipment. He also checked the new marker with his built-in 100 kHz calibrator.

But lo and behold! After talking to a contact who was using the S Line, Big Chicken Little (self-appointed, who did not identify name or call sign) blurted into his QSO, "You are centered out of the band 5 kHz." Randy rechecked his calibration and was within 100 *cycles* of 21,440; muttering to himself, Randy said, "It is hard to believe," and asked what his anonymous contact was using with which to police him. The voice came back very loud and very wide, "You are 21,450 kHz." Throwing up his hands, Randy said, "Maybe this hobby is not for me, after all." *And I think he means it.*

I doubt now he will ever take the Advanced Class exam. Yet I believe he has the knowledge and is qualified.

While he was attempting to teach code to some youngers, he wondered why Extras insisted on getting exactly on 14,020 kHz, etc. So he wrote the powers in Hartford. You should read the reply from an Extra Class correspondent. Guess the answer.

An eyeball contact with Randy confirmed the following facts:

1. Two American passports with visas to almost 35 countries in every continent in the world.

2. An engraved gold Omega watch, stating he had been with his firm over 30 years.

3. Two patent documents in his name for inventions dating 1945 and 1966, one a medical device and the other an attachment which worked in conjunction with his company's electronic equipment.

In addition, he has managed to educate three daughters, two with advanced degrees, and the youngest with an electronic engineering degree from a top technical university.

Randy says: "It is not what the big shots say, it's the way they say it." I agree, and may our *over-enthusiastic, self-appointed "police"* learn at least the first lesson in human behavior. In spite of their knowledge of ham radio they can be wrong, or can they . . .

The other day Randy wrote his will with his lawyer, and among other bequests he ordered carved on his gravestone: "Just How Right One May Imagine Himself To Be, Is No Criteria In The Eyes Of God Or Man."

The big shots could have said, "Randy, when you have finished, may we have a QSO with you?" Then they could have said, "Randy, the QRM is fierce. Let's check the bandwidth of our signal so we will not be adding inadvertently to the problem."

Randy suggests that because he went to all the trouble to have his rig checked and readjusted is no admission that the "policemen" were right.

The moral to this story is: *"If you judge without all the facts, you must stand to be judged by others."*

. . . WN7KUD

Any similarity to names and places are purely coincidental and not intended except to those to which this story applies.

12 CHANNEL YOUR TR-22 OR TR-2200

At last a conversion kit to add the C to your Drake TR-22 or Kenwood/Trio TR-2200. 6 channel units. This kit adds another 6 channels, all directions and parts! P-2200 12 channel conversion kit and directions.....$14.95.

Washington residents pay sales tax and postage extra.

GLENWOOD TRADING CO. LTD.

Electronic Specialists

112 Donaghy Avenue, North Vancouver, B.C., Canada V7P 2L5, Tel: (604) 987-0567

Hank Olson W6GXN
P.O. Box 339
Menlo Park CA 94025

Further Adventures Of The Bounceless Switch

I have presented several pulsers in past articles that hopefully have been of use to amateurs and others involved in pulse circuit testing ("A Pulse Generator for the Amateur," *73*, Nov. 1967, "An IC Pulse Generator for the Amateur Experimenter," *73* Sept. 1971, and "IC Logic Pulser Simplifies Design," *Electronic Products Magazine*, Aug. 16, 1971). Correspondence from readers indicates there is an additional need for a pulser which puts out only one pulse at a time – each time a manual "pulse" button is pushed.

What good is a single-pulse generator? Well, if one can really depend on obtaining one pulse per push of the manual "pulse" button, such a generator can be of great use in analyzing various count-up, count-down, and shift register circuits. For instance, there are as many different circuits for counting by various integers as there are logic designers. By first resetting an unfamiliar counter (usually by means of its reset input), then inputing one pulse at a time to its clock input, we can make up a truth table. This can be done using only the single-shot pulser and a dc voltmeter. An example of such use will be given later in the text.

It might be thought that a single pulse could easily be created by simply using a battery and a switch as in Fig. 1. However, although this method was workable in older relay logic systems, it has severe troubles in generating a single pulse for modern IC logic systems. The most obvious problem with a battery and switch pulser is that of the lack of ability to control the pulse length. Human response time being what it is, pulses shorter than, say, 100 ms are very difficult to time. The less obvious problem, however, (and actually the worst difficulty) is that nearly all switches exhibit some form of bounce. Bounce is the effect of a switch, on closure, to make and break the circuit several (or many) times before staying closed. In a spring-loaded switch, like a microswitch, the term bounce is quite descriptive; however in other switch types the mechanism of making and breaking is more subtle. The details involve microscopic cold-welding alternating with conductor-oxide insulation – but the result is the same: *bounce*. Since even the slowest forms of IC logic respond to on and off signals in microsecond times, switch closure bounce can be seen by the IC s as multiple pulse inputs for each apparent switch closure. This, of course, can cause great confusion when trying to understand pulse-counting circuits.

The single-shot pulser in Fig. 2 solves not only the pulse-length problem, but also assures that only one pulse is generated from

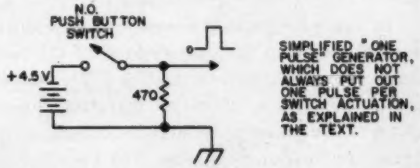

N.O.
PUSH BUTTON
SWITCH
+4.5V
470
SIMPLIFIED "ONE PULSE" GENERATOR, WHICH DOES NOT ALWAYS PUT OUT ONE PULSE PER SWITCH ACTUATION, AS EXPLAINED IN THE TEXT.

Fig. 1. Simplified "one pulse" generator, which does not always put out one pulse per switch actuation, as explained in the text.

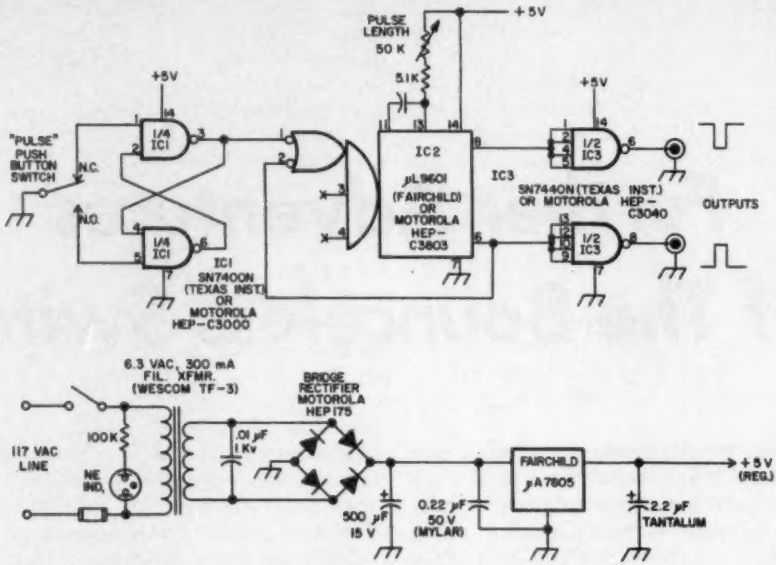


Fig. 2. IC1 = SN7400N (Texas Inst.) or Motorola HEP C3000. IC2 = uL 9601 (Fairchild) or Motorola HEP-C3803. IC3 = SN7440N (Texas Inst.) or Motorola HEP-C3040.

each actuation of the push-button switch (even if the switch bounces). The switch debouncer is a pair of TTL gates wired as an R-S flip-flop, sometimes called a latch. The latch puts out a negative going rectangular pulse, whose duration is dependent upon how long the push-button switch is held down. However, the output pulse length is not controlled by the latch output, but by the one-shot multivibrator (IC_2) which it triggers. The one-shot is one of the newer TTL types, which are much easier to apply than the older DTL one-shots; it is triggered only by the falling edge of the latch output, as it is wired. IC_2 has both Q and $\overline{Q}$ outputs available; that is, it has both a positive output pulse and its complement. These are available, respectively, at pins 8 and 6 of IC_2.

In order to provide as much output drive as possible from the pulser, each of the two outputs are passed through a TTL buffer gate. Since these gates are inverting types, the positive going pulse and its complement exchange output positions. The two buffer gates are contained in IC_3.

A simple regulated power supply is used to make the single shot pulser completely self contained. A 6V filament transformer, integrated bridge rectifier, and 500 μF capacitor form the rectifier-filter section. A Fairchild μA7805 integrated circuit regulator provides the regulation. This power IC regulator has only three terminals: input, output, and ground. Reasonably, the ground terminal is also the heat sink tab on the plastic version used (it is the metal case for the TO3 version); and so, no insulating washers are needed for mounting. In order to assure against oscillations (the IC has rather high gain internal circuitry), a 0.22 μF capacitor is placed directly across the input and ground terminals. There are several other similar fixed 5V regulators available which also could be used: the LM309 (National, EEP, Motorola) or the LM335 made by EEP.

A number of simple changes may be made in the circuits to allow for different requirements. As shown, the pulser will provide pulses approximately 1 μsec to 10 μsec long. Increasing the size of C_1 to 5100 pF will allow for pulses of 10 μsec to 100 μsec, 0.05 μF will give 100 μsec to 1 msec, 0.5 μF will allow 1 msec to 10 msec pulses. These capacitors must be non-polar types

Table 1
Equivalents for IC_1, IC_2, IC_3

UIC_1 = SN7400N (Texas Inst.)		IC_2 = μL9601 (Fairchild)		IC_3 = SN7440N (Texas Inst.)	
MC7400P	(Motorola)	MC8601P	(Motorola)	MC7440P	(Motorola)
USN7400A	(Sprague)	SN74122N	(Texas Inst.)	USN7440A	(Sprague)
N7400A	(Signetics)	N74122A	(Signetics)	N7440A	(Signetics)
U6A740059X	(Fairchild)	AM2601	(Adv. Micro.)	U6A744059X	(Fairchild)
SG7400N	(Sylvania*)	AM9601	(Adv. Micro.)	SG7440N	(Sylvania*)
HSC7400D	(Hughes)	RF8601	(Raytheon)	HSC7440D	(Hughes)
DM7400	(National)	DM7850	(National)	DM7440	(National)
TG-7440N	(Transitron)	SW9601	(Stewart-Warner)	TG7440N	(Transitron)
C3000	(Motorola - HEP)	C3803	(Motorola-HEP)	C3040	(Motorola - HEP)

*Discontinued, but often available as surplus stocks.

such as mica, mylar or polystyrene. If it is desired to use polar capacitors (such as tantalum electrolytics) a modified circuit for

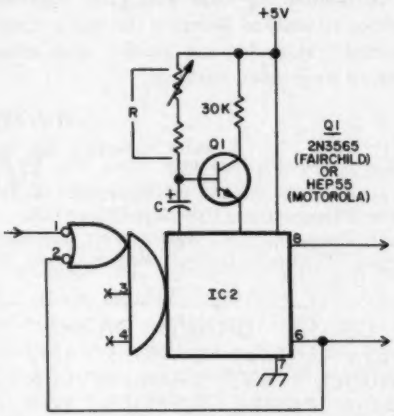


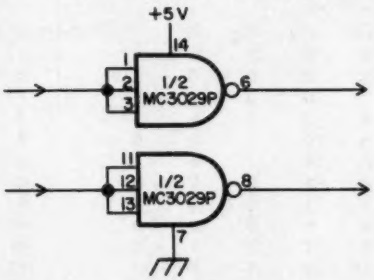
Fig. 3. Modification to allow use of polar capacitor (c) in one-shot timing circuit, and timing resistor (R) larger than 50K. Q_1 = 2N3565 (Fairchild) or HEP55 (Motorola).

the timing of IC_2 (Fig. 3) should be used. This circuit modification also allows the use of timing resistors larger than 50K, and so makes possible really *long* pulses.

If it is desired to have the single shot pulser drive 50, 75 or 93Ω coax cables, another change can be made. By substituting a Motorola MC3029P for IC_3 (with appropriate pin number changes), such coax lines can be driven without ringing and other forms of pulse distortion. Figure 4 shows the several ways in which the MC3029P buffer gates may be wired to drive TTL, 50 to 93Ω coax lines, and 93 to 120Ω coax lines. One may ask why the SN7440N was considered as the buffer in the first place when the MC3029P will provide its function plus the coax drive capability. The reason is that the MC3029P is rather a special case, made only by one firm – the "7440" is much more widely second-sourced.

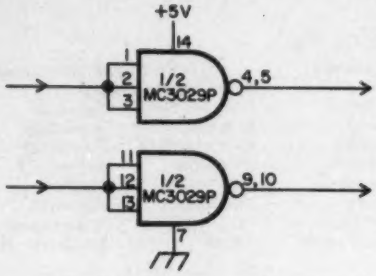
As to substitutions, there are many sources of the SN7400N, SN7440N, and μL9601. Table I gives a listing for pin-for-pin substitutes that would be satisfactory in this circuit. In fact, one could even use DTL units for the latch and buffer gate IC's (IC_1 and IC_3). A μL946 (or MC846P) would directly substitute for the SN7400N, and a μL932 (MC832P) would directly substitute for the SN7440N.

An example of how the single shot pulser can be used is shown in Fig. 5. The pulser output is connected to the clock input of an SN7492N divide-by-twelve counter IC to ascertain what its truth table is (assuming we did not know it). We first actuate S1 to the "1" position, which resets all the four flip-flops to zero. Then S1 is set to "0" in order to count. The outputs Q_0, Q_1, Q_2, and Q_3 are each measured with a dc voltmeter (say a 20,000Ω/V V.O.M.). Now input one clock pulse by pushing the pulse pushbutton on the single shot pulser, and again measure the states of Q_0, Q_1, Q_2, and



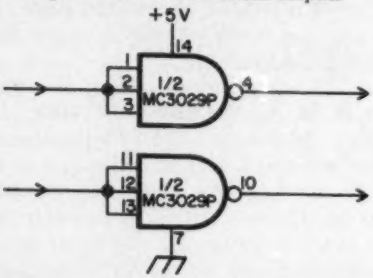
FOR T. T. L. OUTPUTS

Fig. 4A. For T.T.L. outputs.



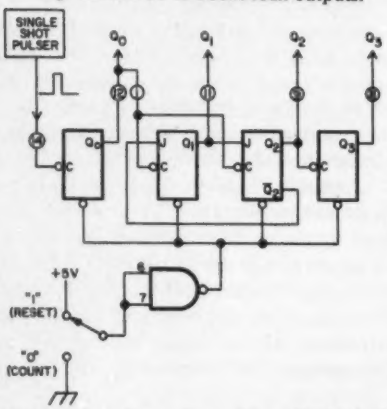
FOR 50 TO 93 Ω COAX OUTPUTS

Fig. 4B. For 50 to 93Ω coax outputs.



FOR 93 TO 120 Ω COAX OUTPUTS

Fig. 4C. For 93 to 120Ω coax outputs.



Count	Q_3	Q_2	Q_1	Q_0	Decimal No.
0	0	0	0	0	0
1	0	0	0	1	1
2	0	0	1	0	2
3	0	0	1	1	3
4	0	1	0	0	4
5	0	1	0	1	5
6	1	0	0	0	8
7	1	0	0	1	9
8	1	0	1	0	10
9	1	0	1	1	11
10	1	1	0	0	12
11	1	1	0	1	13

Fig. 5. Example of using single shot pulser to ascertain truth table of a counter IC.

Q_3. Input another pulse, etc. In twelve pushes of the pulse button we can build up a truth table as shown. Note that *this* counter has a relatively unusual sequence; it counts up from 0 to 5 then skips to 8 and counts on through 13. There are still a total of 12 steps; so it is truly a divide-by-twelve counter, but the count sequence is somewhat unusual.

This example is one that needn't have been done, since the truth table of the SN7429N is well known, and published in the data sheets of its numerous manufacturers. However, there *are* plenty of nutty counters around made up of combinations of individual flip-flops and gates that are tedious to analyze. Running through a count sequence, as above, can quickly shed some light on their inner workings.

. . . W6GXN

1. Olson, H. "A Pulse Generator for the Amateur," 73, Nov 1967, p20.

2. Olson, H. "An I.C. Pulse Generator for the Amateur Experimenter," 73, Sept 1971, p112.

3. Olson, H. "I.C. Logic Pulse Simplifies Design," Electronic Products Magazine, Aug 16, 1971, p42.

DRAKE DRAKE DRAKE

NOW SHIPPING NEW-BOXED 1975 MODEL TR-4C TRANSCEIVERS, AC-4 POWER SUPPLIES, MS-4 SPEAKERS. **PRICE $741.95.**

WANTED DRAKE TRADE-INS

Will allow in trade for your . . .

- TR-3/AC-3/MS-3 ..... $350.00
- TR-4/AC-4/MS-4 below S/N 31320 ... $425.00
- TR-4/AC-4/MS-4 above S/N 31320 ... $475.00
- TR-6/AC-4/MS-4 six meter $475.00
- TR-4 noise blanker ..... $ 50.00
- DC-3 or DC-4 ..... $ 50.00
- RV-4 VFO ..... $ 65.00

Ship your trade-in prepaid insured U.P.S. or parcel post special handling. Upon receipt will ship your new TR-4C/AC-4/MS-4 via prepaid insured U.P.S. We accept master charge, check, or C.O.D. on balance due us.

Write or phone Bill Slep today (704) 524-7519

Slep Electronics Co.

P.O. Box 100
Highway 441 – Dept. 73
Otto, North Carolina 28763

Al Brogdon DJ0HZ
Furstenbergerstrasse 147
Frankfurt a/M, Germany

Is Automated CW Possible?

Many hams who are CW operators are awakening to the fact that the use of a tape recorder in conjunction with their ham stations can take a lot of the work out of transmitting, especially during contests. An article in *QST* September 1962, Magnetic-Tape Second Operator, gave W3GKP's sending system with a tape recorder, but it appeared more complicated than it actually

In *73* June, 1962, my article "A Simple Electronic Keyer" appeared. An equally simple modification was made to this keyer to add the capability of sending pre-recorded magnetic tape messages. Figure 1 shows the was, and this may have scared off some possible uers of the technique. The following article will describe the simplest possible circuit for using automated CW transmitting.

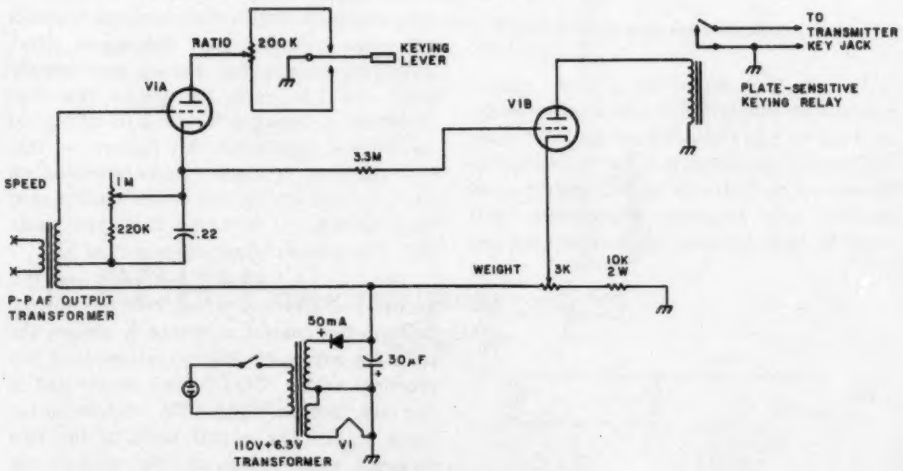


Fig. 1. The original keyer circuit.

original keyer circuit, and Fig. 2 shows the changes necessary. Referring to Fig. 2, the audio from the tape recorder is rectified by the silicon diode and filtered by the audio bypass capacitor. The resultant voltage actuates the plate-sensitive relay which was already used in the keyer circuit. The keyer operation is unchanged after this modification.

If you accidentally connect the diode with the wrong polarity, the keyer will not operate. This is because the polarity of the diode will be such that the current through V1b will follow the path of least resistance, through the diode and the tape recorder af output transformer to ground, and not enough to actuate the plate relay will flow through it. So if your keyer doesn't work after this modification, check the polarity of the diode. If it is in fact correct, then check to see if you have the keyer line cord plugged in. Further trouble shooting is beyond the scope of this article.

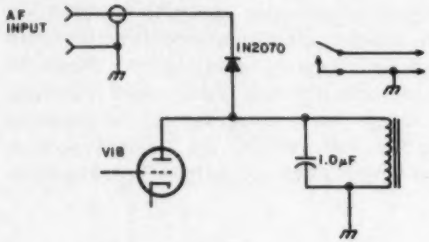


Fig. 2. Modified version of the keyer.

In case you don't use a keyer with a negative dc supply (with respect to ground), or want to build this second operator independent of the keyer, just use the circuit as shown in Fig. 3. It can be built into a small minibox, with no power requirement, or it could be built into the tape recorder becoming an on-off keyed circuit. Various other possibilities will suggest themselves to match the individual ham station.

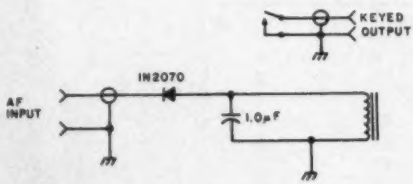


Fig. 3. Use this circuit to build independent unit.

It should be mentioned that the parts specified in this article are junk box values and represent simply what was on hand at the time the idea was tried out. Any diode which will handle a few mils will do for the rectifier, and any af bypass condenser value from 0.1 to 1.0 μF will be OK.

So that's all there is to the construction of the gadget. What could be simpler! It has been convenient in my station to place the recorder on a small shelf beside the operating table and permanently connect it with patch cords to both the electronic keyer and the receiver (more on this later). Now let's consider some of the possibilities with the set-up.

As W3GKP suggested in his article, it is possible to buy an older model recorder in fair condition at a reasonable price. For this application, you don't need anything approaching hi-fi, so you may be able to pick up a recorder still in good mechanical condition simply because its audio quality is not up to modern hi-fi standards. However, if you want to use the family recorder rather than buying one just for the ham station, this circuit is ideal, since no modifications need be made to the recorder to use it.

If you do buy an older recorder, something that's worth looking for is one with two playback heads. This type of recorder will play with the tape moving in either direction, rather than having to manually swap the two reels to reverse the tape direction. I managed to get hold of a good old Webcor which has this feature, so that two different messages can be recorded on the two tape tracks, and either track played back simply by selecting the appropriate tape direction by the selector switch.

Thus, in an ARRL Communications Department Party (in which the transmitted half of the contest exchange is always the same for any given station), a tape loop was prepared with a "CQ CD" call on one side of the tape, and an "ORS WPA" report on the other track. The actual texts of the two messages were chosen so they were of the same duration, and recorded with the same index point on the loop. Then it was a

GET TO THE TOP FAST!

NOW YOU CAN CHANGE, ADJUST OR JUST PLAIN WORK ON YOUR ANTENNA AND NEVER LEAVE THE GROUND!

ROHN manufacturers towers that are designed and engineered to do specific jobs and that is why we have the FOLD-OVER TOWER . . . designed for the amateur. When you need to "get at" your antenna just turn the handle and there it is. Like other ROHN big communication towers, they're hot dip galvanized **after** fabrication to provide a maintenance free, long lived and attractive installation. ROHN towers are known and used throughout the world . . . for almost a quarter century . . . in most every type of operation. You'll be in good company. Why not check with your distributor today?

ROHN ® **MANUFACTURING**

DIVISION OF UNARCO

P.O. Box 2000 / Peoria, Ill. 61601

simple matter of starting the tape to call CQ until it had had time to attract some attention, then stop the loop at the index, sign "K" with the keyer, and listen for a reply. If a reply was produced, the station's call sign was signed by keyer (manually) and the second tape track started. This gave the contest exchange for my station (K3KMO) while the log was filled out. Then when the tape loop had run, the tape was stopped and the incoming half of the exchange copied, with all log-keeping up to date and ready for a new contact when the transmission was receipted for.

However, woe be unto him who falls asleep with his automated station calling CQ, for his call sign shall be eternally remembered. . .

It is surprising how much of the work of a contest can be eliminated by such automated sending taking care of the repetitious transmissions for you. When the contest is hot, it helps the operator keep his logging caught up. When the contest begins to thin out, the operator can turn on the endless loop and call CQ until he rounds up the last few strays, and he can sit back and relax a little. However, woe be unto him who falls asleep with his automated station calling CQ, for his call sign shall be eternally remembered, his fame shall be known far and wide, and his name shall be mud forevermore!

W3GKP mentions in his article that he records his tape loops by taking the af output from his receiver while monitoring his transmitter (with the final turned off, naturally). This is a very easy technique. Also you can use your normal station monitor to do the same things. However, W3GKP failed to mention something regarding the recording of his own signal in his receiver that should be fairly obvious – the same thing can be done with any incoming signal. Thus, you can record another ham's signal and play his first back to him through your keying unit to show him what his sending is like. With careful adjustment of the receiver audio note and i-f bandpass characterisitcs, it is possible to eliminate most interference and get a good quality recording of any average signal. A little experimentation will show you the best tuning technique to use with this trick.

Also, recording and playback through the keying unit can be used to pass traffic on the CW nets – that is, if you are not ashamed of sending the other fellow's fist over your call sign! If this is done, the traffic should always be copied by hand simultaneously with the tape recording, to insure that you have a solid copy.

Another good trick is to use a two-speed recorder to either double or halve the transmitting speed. It is fun to use this technique at both ends, and make all the kids on your block think you and your contact are real speed merchants. However, you may attract the attention of an honest-to-goodness speed merchant, and be embarrassed. So be careful.

Numerous stations are helping to supplement W1AW's code practice transmissions nowadays by re-transmitting their material on six and two meter MCW or CW to help the Technicians over the code hurdle. This can be done quite easily with this tape-transmitter. Also, this gives you the capability of feeding the receiver audio output right into the keyer af input, so you can re-transmit directly. A switching arrangement can be used to kill the automatic relay when W1AW is signing its call, so you can take the opportunity to sign your own station call sign.

The possibilities of a recorder-operated station are almost limitless. You can add many more uses than those mentioned in this article. For instance, you too can have a CW phone patch such as I once had. Or you could help a physically-handicapped person with a unit for him to send CW by speaking "di-dahs" into a microphone. You can supply many more uses of your own.

I have played around with completely pre-recorded chatter for an entire contact, so that all he needed to do was to start the recorder calling CQ, then after receiving a reply, sign the call sign of the calling station and then let the recorder take over. If the tape-recorded QSO trend catches on, it may end up with two hams' recorders talking to each other while the two operators go out and have a beer. . . . DJ0HZ

TECO presents YAESU

When You're Hot - You're HOT!

FL 101
DIGITAL TRANSMITTER

- Total coverage capability: 160 thru 2 meters + 12 major S.W. bands.*
- Direct frequency readout to 100Hz.
- Provision for all-mode reception: SSB, CW, AM, RTTY & FM.**
- Reliable, plug-in, modular circuitry.
- Compatible transceive operation with 101 series.

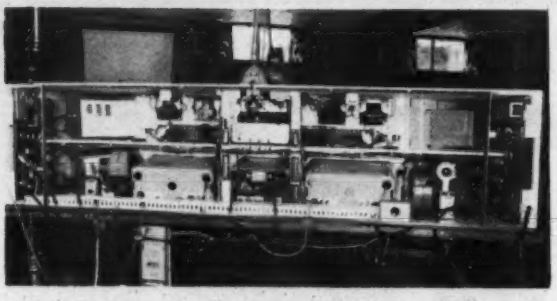
FR 101
DIGITAL RECEIVER

- 240 Watts PEP.
- 160 thru 10 meter coverage + 2 optional auxiliary bands.
- All-mode operation: SSB, CW, AM & FSK.
- Reliable, plug-in, modular circuitry.
- Provision for RF speech processor.

SIGMASIZER 200R

- Total Coverage 146-148 MHz
- 200 Channels
- 1 or 10 Watt Output
- Automatic offset–600 kHz–high or low.
- Built in tone burst
- Priority Channel Feature
- Simplex or repeater operation

TECO a subsidiary of Tucker Electronics Co.
P.O. BOX 1050 1717 S. Jupiter Rd. GARLAND, TX. 75040
214—348-1560



In between working one hundred countries on slow scan, Gene has done one of the better jobs of putting together a console for his station. Take a look at it . . . it took him over five months to whomp this up. Take a peek at the front cover and you'll see that Gene has left little out. Digital clock (local time) – dummy load indicator – antenna indicator – antenna control and main power control – speech processor – temperature indicator, in and out (Heath) – frequency display (Heath SB-650) – tape recorder – tower lights – 75S 0 32S – dummy load – slow scan unit – tower up and down – digital clock on GMT – SSTV monitor – elapsed time meters – antenna height indicator. Antique addicts may be horrified to learn that the base of the console is a 90 year old roll top desk made of solid oak. The front panel is made of white leather finish Formica while the top and ends are oak Formica to match the desk. The back of the console is enclosed with 1/4" (6.35 mm . . . hi) Plexiglass. How Gene was able to build this beautiful and neat console and still keep his car in there to be the first to work 100 countries on slow scan is a mystery. Either chore would seem enough for any energetic amateur to accomplish.

C31HD – ANDORRA
KC4USX – ANTARCTICA
CN8HD – MOROCCO
CP1FW – BOLIVIA
CR8CA – ANGOLA
CT1PG – PORTUGAL
CX2GB – URUGUAY
DJ9CN – GERMANY 1971
DJ7UP – W. GERMANY 1973
DU1FR – PHILIPPINES
EA4DT – SPAIN
EA6BQ – BALEARIC IS.
EA8CI – CANARY IS.
EL2CB – LIBERIA
EP2FB – IRAN
ET3DS – ETHIOPIA
F6AXT – FRANCE
FG7XT – GUADELOUPE IS.
FL8BH – FR. SOMALILAND
FM7WW – MARTINIQUE
FP8AO – ST. PIERRE IS.
G3ZT – ENGLAND
GC3YIZ – GUERNSEY IS.
GI3WWY – N. IRELAND
GM3KJF – SCOTLAND
GW3DZJ – WALES
HA7LF – HUNGARY
HB9IT – SWITZERLAND
HB9NL – LIECHTENSTEIN
HC1BU – ECUADOR
HK7XI – COLOMBIA
HL9WI – KOREA
HP1XMU – PANAMA
HR2NH – HONDURAS
HS1AHE – THAILAND
HZ1SH – SAUDI ARABIA
I1LCF – ITALY
IS1PEM – SARDINIA
JA7FS – JAPAN
JY8AA – JORDAN
W4MS – USA
KC4DX – NAVASSA
WA6AXE/KG6 – GUAM
KH6DEH – HAWAII
KL7DRZ – ALASKA
KP4GN – PUERTO RICO
KS6DW – SAMOA
KV4CM – VIRGIN IS.
KX6DR – MARSHALL IS.
LA3BG – NORWAY
LU7AAG – ARGENTINA
LX1SK – LUXEMBOURG
OA4F – PERU
OD5HC – LEBANON
OE6GC – AUSTRIA
OH5RM – FINLAND
OK1NH – CZECHOSLOVAKIA
ON4DN – BELGIUM
OX3LP – GREENLAND
OY1M – FAEROE IS.
OZ4IP – DENMARK
PA0LAM – NETH. AMSTERDAM
PJ2CU – NETH. CURACAO
PY2EEG – BRAZIL
PZ1DA – SURINAM
SM4AMM – SWEDEN
SV1CG – GREECE
TI2GSW – COSTA RICA
TJ1AX – CAMEROON
TR8WB – GABON REP.
TU2DQ – IVORY COAST
VE8RM – CANADA
VK3MF – AUSTRALIA
VK9XX – XMAS IS.
VP2MC – NEW GUINEA
VP2AR – ANTIGUA
VP2ME – MONTSERRAT
K4GXO/VP7 – BAHAMA IS.
VP9GR – BERMUDA IS.
VQ8R – SEYCHELLES IS.
VS6AI – HONG KONG
VU2SKV – INDIA
XE1JM – MEXICO
XW8AX – LAOS
YN3RBD – NICARAGUA
YU2CDS – YUGOSLAVIA
YV5AS – VENEZUELA
ZF1AO – CAYMAN
ZL1AOY – N. ZEALAND
ZS6UR – SOUTH AFRICA
ZS3B – SOUTH WEST AFRICA
4X4VB – ISRAEL
9M1AT – W. SAMOA
6Y5FB – JAMAICA
YB3AAY – INDONESIA
8R1W – GUYANA
9K2AM – KUWAIT
9Q5BG – REP. OF CONGO
9X5PS – RWANDA
9Y4VU – TRINIDAD

COVER

Gene Kundert W8YEK
735 E. 5th St.
Delphos OH 45833

W8YEK Works 100 Countries on SSTV

I have 91 countries confirmed. Herewith is a list of the 100 countries I worked 2XSSTV. Also a list of the ones that did not QSL so far. Some were recent contacts.

EA6BQ was country #100.

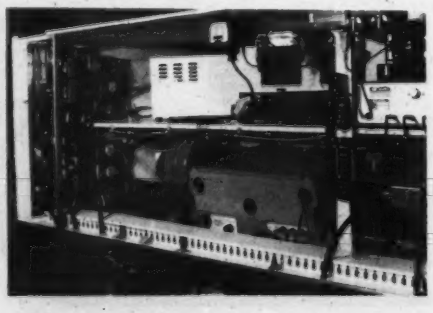
I also had a two way with TI2GSW and no QSL from him. I did hear that EP2FB sold out, so that card is lost. I may have to work 115 countries to get 100 cards.

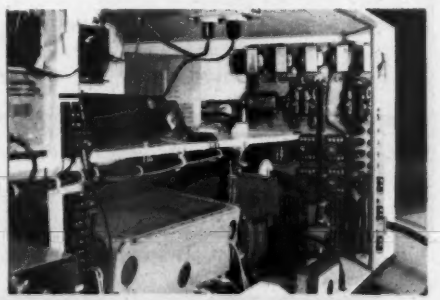
I worked Faisal (HZ1SH) several times and did not know who he was so I thought maybe the poor guy was hard up. I enclosed IRC's and still I received no card. So I did it again, IRC's and all. Then I picked up a newspaper one day and there it was – Faisal puts oil embargo on USA.

1	EP2FB	JAN. 4, 1973
2	HZ1SH	JUN. 15, 1973
3	K4PGM/TI7	MAR. 24, 1974
4	C31HD	AUG. 6, 1974
5	FL8BH	AUG. 14, 1974
6	CX2GB	AUG. 20, 1974
7	GM3KJF	NOV. 1, 1974
8	HC1BU	NOV. 2, 1974
9	EA6BQ	NOV. 8, 1974

I operate 10 to 12 hours a day, 7 days a week in the winter and in the summer 2 to 4 hours a day. I find that if you want to work 'em you have to be on the air a lot. If I receive any QSL's from the above 9 I will drop a note to 73.

... W8YEK





Wilson Electronics

SAVE $ - BUY FACTORY DIRECT

SPECIAL WINTER SALE!!!

WILSON 1402SM HAND HELD 2.5 WATT FM TRANSCEIVER

* Rubber Flex Antenna
* One Set of Crystals 52-52

Standard Frequency, $8.00 pr.;
Odd Frequency, $6.00 ea.

$280 VALUE ALL FOR JUST $169.95

- 6 Channel Operation, Individual Trimmers On All TX and RX Xtals. All Xtals Plug In.
- S Meter Battery Indicator.
- 10.7 and 455 KC IF. 12KHz Ceramic Filter.
- .3 Microvolt Sensitivity For 20dB QT.
- 2.5 Watts. Nominal Output 12 VDC.
- Microswitch Mike Button.
- Size 8-7/8 x 1-7/8 x 2-7/8 Inches.
- Weight 1 lb. 4 ounces. Less Battery.
- Current Drain RX 14MA TX 380 MA.

ACCESSORIES:
SMI Speaker Mike $24.00
BCI Battery Charger $29.95
1410A Amplifier Mobile Mount $99.00
10 - NICADS $14.00
LCL Leather Case $12.00

90 DAY WARRANTY
FULL MONEY BACK GUARANTEE

To: Wilson Electronics
P.O. Box 794
Henderson, Nevada 89015
(702) 451-5791

Ship me 1402 SM Winter Special
Plus ☐ SM1 ☐ 1410A ☐ BC1 ☐ NICADS ☐ LCL

Enclosed is $_____ ☐ Check ☐ Money Order
☐ Master Charge ☐ Bank Americard
#_____ M/C Interbank #_____
Card Expiration Date_____
Extra Xtals_____ _____ _____
Name_____
Address_____
City and State_____ Zip_____

All orders will be shipped Air Mail within 24 hours after receipt of order (excluding weekends). Enclose additional $3.00 for prepaid Air Mail shipping. Nevada residents add sales tax.
Sale ends March 31, 1975

CASSETTE RECORDER specials

Is this the IDEAL cassette deck for the Ham Shack?

Panasonic RS-261US — with five C-60 tapes
$89.95

After checking hundreds of tape decks made by over 50 manufacturers, no other deck even came close to meeting the specifications.

HIGH FIDELITY

Once you have a good tape deck you will probably want to use it for music, so hi-fi is important. This deck is capable of superb fidelity recording and playback.

LOW PRICE

You want the lowest priced deck that is capable of meeting your requirements, with slow scan being an important application. This is one of the few decks on the market which provides good quality recording without going to extremes such as the Dolby noise reduction circuit, automatic reverse, CrO2 bias, and things like that. Lower priced decks don't make it for you because their tape drive systems are too cheaply made and they have unacceptable flutter and wow as far as hi-fi and SSTV are concerned. Most cassette decks today are running in the $250 to $350 range.

STEREO OR MONO RECORDING

When you put nearly $100 into a tape deck you want it to be usable for a music system. . .and that means stereo today. This is also handy for slow scan where you put the picture on one channel and accompanying audio on the other, each to be transmitted on separate sidebands. Slide shows can have commentary on one channel and slide projector signals on the other. This recorder has a switch in the back to provide stereo or mono action. . .few decks have this, even in the $400 models.

DB METERING FOR BOTH CHANNELS

This deck has illuminated meters so you can set your levels right and keep an eye on them. Tape has a rather narrow range of recording level so good meters. . .ones that are easy to read. . .are very important. If your levels are too low the sound is down in the tape hiss. . .if they are too high you get distortion. You get the best dynamic range from your tape when you have good meters for setting your levels.

MANUAL VOLUME CONTROL

Not one of the lower priced cassette decks has a manual volume control for recording. This means that there is no possible way for you to do an adequate job of recording good music for the automatic gain controls they use raise and lower the gain for you and ruin the normal dynamic range of the music. They are handy for recording lectures where you can't keep an eye on the meters, but manual is best. Try recording Morse code on an AGC recorder!

PAUSE CONTROL

Another function found only on expensive recorders. . .the pause control allows you to stop the tape instantly so you can edit as you record. . .starts instantly too. You can't do without this for slow scan. The pause control permits you to turn on the deck and set your levels before starting the tape.

AUTOMATIC STOP

What do you think it does to a captain when it keeps going at the end of a tape. It doesn't do anything any good. It wears rapidly, thus changing the speed of your tape in the future. . .it quickly wears out the tape so it can break, etc. The more expensive decks stop at the end of the tape, automatically. You want this.

HEADPHONE OUTPUT

There are many times when you want to be able to monitor as you record, so you want some sort of headphone output. You may want to use the deck without any power amplifier. . .just plug in your headphones. Have you heard stereo with headphones? It beats speakers in every way. . .the results are incredible and suddenly you realize how fantastic stereo can really be.

AC POWER

Battery operated tape decks are fine, but they start at $350 for any with quality recording and the batteries wear out very quickly. Around the ham shack and home you want ac powered gear.

LOW PRICE

The price on this deck is so astounding that it deserves mention twice. . .while everything else is going up in 10% leaps, Panasonic has reduced the price on this deck from $110 to $89.95!

FREE TAPE!

Just to help you get an RS-261US cassette deck while you are still young, you'll get five (5) music quality C-60 cassettes free if you order right away. That's almost $10 worth of tape as a bonus.

BLANK TAPES

Low noise tape cassettes — excellent quality

C-60 60 minutes. . . 99¢ (reg $1.29)
C-90 90 minutes. . .$1.49 (reg $1.79)
C-90 Extra Hi-fi. . .$2.25 (reg $2.99)

BETTER QUALITY PORTABLE

The TC-12 is medium priced cassette recorder. . .and a real bargain. It runs from built in batteries. . .120v or 220v ac. . .jack for line in for recording from another tape recorder, radio, slow scan, RTTY, etc. Headphone jack for output monitoring, output to other recorders, to slow scan monitor, etc. Also has a 6v power input for external dc operation. AGC automatic volume control for recording so you don't have to set recording levels. Peak indicator to keep you from overmodulating the tape. Rewind and fast forward keys will stay down so you don't have to stand and hold them to use. . .a bad function on many recorders. Use this in your car, in the shack, anywhere. Ideal for slow scan work mobile!

TC-12 Cassette recorder **$32.95**

ECONOMY PORTABLE

The TC-8 operates from built in batteries . . .or 120v ac. . .it has remote start/stop. . . the rotary switch control is one of the handiest made. . .mike input. . .earphone/line output. . .great for code practice. . .even okay for rock music. . .has automatic level control and peak indicator. Fine for portable slow scan work too.

TC-8 Cassette recorder **$23.95**

CLOSE OUT BARGAIN

The PM-760 is identical to the TC-8, but without the 120v ac power. . .batteries are built in for portable use — anywhere. Comes with mike and earphone. Made to sell for $25.

PM-760. . .Cassette recorder
SPECIAL. . **$19.95**

Shipping info. . .Cassette units are sent by UPS collect or parcel post collect in non-UPS areas. Tapes are sent postpaid.

order today
from Cassette HQ — Box 431 — Jaffrey NH 03452

Bob Baird W7CSD
3740 Summers Lane
Klamath Falls OR 97601

Joys of The One Night Stand

How do you get your kicks in ham radio? Depending on the individual there are many ways. Some spend their time strictly on CW, some on phone, some are rag chewers. Some spend all their time on the nets, some chase DX, and some do nothing but build new gear. There are those that spend their time mobiling. And some think QRP is the only way to fly, while others have to have stacked yagis 100 feet high with the legal limit of power. Still others find overseas phone patching is their thing. Choose your own poison.

We get our kicks from portable operation of the temporary one or two night stop. We have hammed from camp locations by the hundred and to some extent from motels, beach cottages, mountain cabins and other permanent structures. We have alluded to this in several articles previously which will be noted as we go along. The purpose of this article is to relate a few of our adventures in the world of hamming while traveling, but not mobile. We hope a few more will join the fun.

Just setting up camp, cooking your meals, hiking and fishing can be a lot of fun. But eventually you run into some time that you don't know what to do with. The fish quit biting or you are tired of walking around and then it is time to set up the portable ham gear and enjoy a little hamming. You can get quite a kick out of just telling the guy who is sweltering in 100° heat how nice and cool it is up in the mountains. Or maybe you have need to get a message back home and you are 50 miles from a telephone. Either way hamming is a mighty fine adjunct to camping. It can be fun whether you camp in a tent, a trailer, a camper or a 20 kilobuck motor home.

airwaves electronic

IN STOCK
Bearcat Scanning Monitors, Crystals and Modules

MIDWEST HEADQUARTERS
for
MIDLAND and SBE
2 meter FM

JON – WB9NIH
DON – WB9IFI

Call for our Special prices
(312) 355-3524
Or write for full details...

805 east ogden ave.
naperville ill. 60540

PARTS! CORNELL TUBES!
FREE Send For FREE
CORNELL'S
New Color
Catalog
48 Pgs. New Items
33¢ per tube
IN LOTS OF 100
36¢ per tube
ORDER FREE
IF NOT SHIPPED
IN 24 HOURS!
4215 S University Ave. San Diego, Calif. 92105

WORLD QSL BUREAU
5200 Panama Ave., Richmond CA USA 94804
THE ONLY QSL BUREAU to handle all of your QSLs to anywhere; next door, the next state, the next county, the whole world. Just bundle them up (please arrange alphabetically) and send them to us with payment of 6¢ each.

EPOXY GLASS CIRCUIT BOARDS
NEW G10 1/16 in. THICK, COPPER CLAD ONE SIDE, 1 oz. COPPER.
Pack of 10-4"x 4" –$5.60/Pack of 25-$12.50
Pack of 10-4"x 6" –$8.20/Pack of 25-$18.25
(Calif. Res. add sales tax)
TRUMBULL
833 BALRA DR., EL CERRITO, CA. 94530

3600 Ft. Recording Tape.
By Soundcraft and/or 3M (#150)... 3600 feet of 1 mil extra-strength polyester 1/4" Recording Tape, wound on a 10-1/2" plastic reel. Though used once or twice, this "low-noise" tape is perfect in every respect, and can be used for any of the usual recording (voice or music) applications. Can be re-wound on smaller reels.
Cat. No. TM19K763F 3 for $10.50 Postpaid
7" REEL – 1800 FT.
Recording Tape, exactly as above – except – 1800 feet on standard 7" reel.
Cat. No. TM20K310F 3 for $10.00 Postpaid
Not On Our Mailing Lists? Write to Dept. O
HERBACH & RADEMAN, INC.
401 East Erie Ave. Philadelphia, Pa. 19134

What Type of Rig Do You Need?

Generally, if you are going camping, you are not likely to have an ac line. So it is highly desirable to have a rig that will operate from a storage battery. A number of the Swan family have dc modules available, but most are hard on an outboard storage battery. A Swan 350 will go through a heavy duty storage battery in less than 5 hours. This is OK if you are going to be out for no more than a couple of days and expect to do more fishing than hamming. The new solid state Swans should do much better. The SBE33 and 34 are excellent for battery drain. We presently have an FT-101 which has never run our heavy duty battery clear dead. We believe it will run for 12 hours. And 12 hours is a lot of hamming before you get to the next place that you can charge the battery. Obviously any of the solid state QRP rigs will run for days from a big storage battery. If you are traveling to motels or with a motor home with built in ac power, anything portable with less than a Mack truck is fine for portable operation.

Power Supplies

As mentioned above we would regard a heavy duty storage battery as a prime source of power. Now, none of the aforementioned rigs will actually deliver full rated power from a battery. In general, they are designed for mobile use with the car generator charging at all times. This means about 14V. We have an extra cell for our battery, making 14V. You still don't have full power but you have more. *Caution:* Read your instruction book before adding an extra 2V! The only other power possibility, aside from a possible ac line being available, is a portable gasoline generator. We have a Zeus capable of furnishing all of the power we could possibly want but we very seldom use it. It is driven by a cheap lawnmower type engine which is noisy. If you are camped within 91.44m (100 yards) of a neighbor camper you will be about as popular as a small kid riding a motor bike all around camp. The problem is not exhaust, its the motor itself. Even with a good muffler you still have the clank of a cheap engine. The Honda company makes the quietest portable gas gener-

ator we have used. You can talk into a mike less than 6.1m (20') away from the engine. Apparently they machine their parts a little better than the Americans. If you can get on the outside perimeter of a camp ground and then run an extension cord back into the woods for 30.48 meters (100') and use a good muffler the gasoline generator is a good way to go.

Antennas

By and large the simplest antenna to get going is the dipole. A forty meter dipole will work on 40 and 15m. Once measured the correct length it will get by regardless of the height. In the good ole days Amphenol and others made 72Ω ribbon that was smaller than zip cord and all you had to do was zip out 33 feet and tie a knot in it, the remaining length being feeders (60+ feet each side if you are interested in 75 meters). This writer would be most happy to buy a couple hundred feet of 72Ω receiving twin lead if anyone has some back in the attic or down in the basement, because it is simply not available any more. However, ordinary twin lead rubber zip cord is not bad. Z_0 is about 95Ω. Losses are unknown. But we have had many 40 and 15m contacts, including some DX ones, using 10.06 meters (33') of zip cord each side of a knot.

Now as to getting the antenna up in the air. Naturally the higher you can get it the better, but it *will* work even if tied between two picnic tables. We worked VK land with a dipole draped on blackberry bushes less than 8 feet from the ground, from an Oregon beach campground. But our favorite method is to shoot a two ounce fishing sinker attached to the spinning rod, over a tree limb, with a sling shot.[1] We then reel the fish line back in with nylon cord attached and hoist up our antenna. If you are a baseball pitcher maybe you can throw a weight over the limb or spin a weight around and around releasing it at the proper time. In any event you need a spool of nylon cord.

Next to the dipole the ¼λ ground plane would be most important, especially if you are interested in working the higher frequencies. We presently have a portable ground plane made of telescoped aluminum tubing which will telescope from 2.44m – 4.87m (8' – 16'), thus covering 10, 15 and 20m. Cost for two of these was less than $12. We use the roof of a Ford van for the ground plane. However, the vertical element may be a wire secured to a limb overhead or even a pole wrapped with kitchen aluminum foil.[2] And the ground plane may be random wires on the ground. The main trouble with a ground plane in camp is the radial wires being where people trip over them. This could be alleviated by making the bottom of the vertical element and the ground plane 2.44m (8') from the ground. This usually presents construction problems though.

Last but not least comes the quarter wave Marconi antenna. This is especially good for 40 or 80m and the motel traveler. Again, once you get the length established you can expect to stay under an SWR of 2:1 for nearly all cases. Measure out a quarter wave length of wire. (From the standpoint of public relations the smaller the wire the better, and erecting after dark is not a bad idea either.) Use 50Ω coax (NOT 72Ω) and hook the wire to the hot lead. Connect the

2 meter 6 cavity duplexer

■ $350.00 PER SET

■ 600 KHZ SPLIT ■ PRE ASSEMBLED
■ 50 OHMS ■ VSWR 1.2:1
■ 250 WATTS
■ ADJUSTABLE COUPLING LOOPS FOR VARIABLE INSERTION LOSS
■ MODELS FOR 220MHZ & 450MHZ AVAILABLE

A $100.00 DEPOSIT IS REQUIRED ON EACH ORDER
BALANCE COD FOB LOS ALTOS, CAL.

SWIVETER 544 LASSEN ST LOS ALTOS,CA 94022

shield to anything that looks like a ground. The ground can be a vent pipe on the motel, an eave trough, a steel railing on the upstairs tier, even an aluminum screen door. The closer to perpendicular to the assumed ground that you can go with the wire the better, although even practically parallel *will* work. In the latter case you might have to adjust the length of the wire by a foot or two to get under 2:1 SWR. A dipole is fine for a motel also, but difficult to attain with the feeders at your apartment. Needless to say you have to be on pretty good terms with the motel manager to put up a 75m dipole across the front wings of the motel. So we used the quarter wave wire in 30 or 40 motels all over ZL land where they usually have metal roofs for the substitute ground.[3]

Some Examples of What You Can Do Operating Wise:

Much has been speculated about the effects of trees on radiation. Our observations at least in the summer time, is that trees don't really affect things that much. On the lower frequencies you can work as far as you can at home with the same power with or without trees. We have made WAC several times in a forest so thick you couldn't see through and with the antenna half as high as the trees.

If you have need for a low frequency antenna don't assume the one you have up is useless: it may work. A 40m dipole will not work on 80 the good book says. If you have a short haul situation to get back home go ahead and load it up to something less than rated power. You can work 100 miles or so with no difficulty. You may have a 3:1 SWR but at half power it won't hurt for a few minutes. You can break a net and get your message through. By the same token a 40m dipole won't work on 20 either. We had one up about 50 feet recently and didn't want to get out the ground plane for 20 so we checked the SWR which turned out to be 1.5:1. So we fired up the FT-101 and worked Florida on the first contact.

The worst antenna we ever had worked for at least 200 miles on 75 meters. We were in a motel practically in the center of Dunedin, New Zealand, on a main traffic lane. There was absolutely no place to hang an antenna. We clipped the shield of the 50Ω coax to the roof and draped about 60 feet of wire on rose bushes less than three feet high around the end of the building in the shape of a "U." We did have to adjust the length of the wire to get less than a 2:1 SWR but we worked several stations and even got invited out to dinner. I suppose the best antenna was a 100 foot water tower in Merrill, Oregon, which we shunt fed.[4]

While in ZL land we occupied ZL1KN's beach cottage in Whangamata, New Zealand, for about 10 days where we mounted our whip antenna on top of a rotary clothes line and, using the clothes line for a ground plane we tuned up our SB 34 on 20 meters. A neighboring boat builder and his wife came over to visit one evening and he wanted to see how ham radio worked. We turned the rig on and a CR4 in the Cape Verde Islands was calling CQ. He answered and gave us a 5 by 6 report. Sometimes things work when you want to show them off!

Several years ago we stayed at a motel at Shasta Lake in California on the second deck. We laid our 40 meter dipole on the wooden railing and the first station we worked on 15 meters was in Korea. This was with the SB 34. Another time we were camped in Colorado near the Air Force Academy. Our camp was at the foot of an earth filled dam 50 feet high. We were less than 50 feet from the face of the dam on the south side. With a Swan 350 and a fiber glass fishing pole wrapped with wire we worked a Russian in the Ural mountains at 10 o'clock at night on 15m. His direction was directly into the face of the dam. Maybe it came the long path, I don't know. Anyhow, you can have a lot of fun operating from strange and different remote locations. Give it a try.

1. Antenna Matching Systems, W7CSD, July 1973, *Ham Radio*
2. The Poor Man's Occasional Antenna, W7CSD, Feb. 1967, *73*
3. An Oregon Yankee in Kiwi Land, W7CSD/ZL1BHC, June 1972, *Break In*
4. Ready Made Emergency Antenna, W7CSD, July 1961, *73*

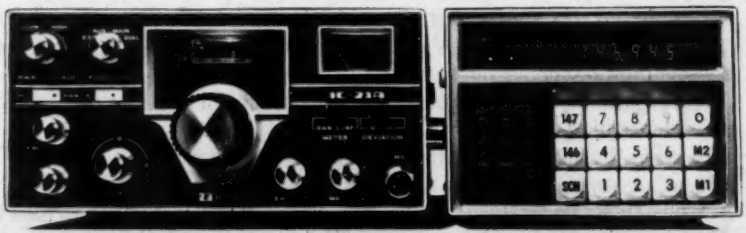
... W7CSD

DIGITAL!

DV-21

The perfect companion for your IC-21A, the DV-21 is an all new unique digital VFO to complete your ICOM 2 meter station. The DV-21 will operate in 5 or 10 KHz steps over the entire 2 meter band. It can also scan either empty frequencies, or the frequencies being used, whichever you select. Complete, separate selection of the transmit and receive frequencies, is as simple as touching the keys. When you transmit, bright easy to read LEDs display your frequency. Release the mic switch, and the receive frequency is displayed. There are also two programmable memories for your favorite frequencies.

You won't believe the features and versatility of the DV-21 until you've tried it. It's new, and it's from ICOM.



Distributed by:

ICOM

ICOM WEST, INC.
Suite 232—Bldg. II
300-120th Ave. N. E.
Bellevue, Wash. 98005
(206)454-2470

ICOM EAST Div. ACS Inc.
Suite 509
13777 N Central Expwy
Dallas, Texas, 75231
(214)235-0479

now available ...TPL VHF-UHF power amplifiers

TPL brings you the finest amateur RF amplifiers for VHF FM available today. Only state-of-the-art techniques in circuit and semi conductor technology make an amplifier of this quality possible.

The amplifying transistors are of the balanced emitter silicon power type. Each one is individually checked for power output and reliability during mismatch conditions. They are operated well within the factory's suggested limitations for added reliability and life. Most circuitry is of micro-strip technique for stability and broadband characteristics. Antenna switching is accomplished through the use of a specially selected RF relay . . . activated by only one watt of RF power through an RF sensing circuit. During receive, the antenna by-passes the amplifier and is fed through the relay to the transceiver. Also of note is a reverse voltage protection diode which protects the power transistors from destruction in the event the amplifier is connected to the wrong polarity. TPL amplifiers are simple to install and fool-proof to operate. With proper care, they will provide a lifetime of dependable service.

DID YOU KNOW...

TPL is the largest manufacturer of accessory solid state RF power amplifiers in the world.
TPL commercial amplifiers are used and recommended by every major manufacturer of commercial communication equipment.
TPL's engineering staff contributed to the development of RF power transistors from their earliest inception.
TPL offers the broadest selection of RF power amplifiers.
TPL offers the highest quality RF power amplifier available.
TPL guarantees its amplifiers against defective parts and workmanship for a full year.
TPL power amplifiers and repeater amplifiers are now available at your local dealer.

talk power by TPL COMMUNICATIONS INC.

13125 YUKON AVENUE / HAWTHORNE, CALIF. 90250 / (213) 679-0131

F. E. Hinkle, Jr. WA5KPG
9503 Gambel's Quail Trail
Austin TX 78758

KOX for CW

Something like VOX

VOX was invented for the lazy phone operator. Probably by a lazy operator. Phone operators have been using VOX systems since the advent of SSB. The manufacturers of ham gear have carried this over to the application of VOX during the CW mode of operation. Though this greatly simplifies the operation of the station, everyone who operates a commercially bought rig will admit that the CW features in today's SSB designs are not meant for ardent CW men.

I was trying to modify a friend's transmitter to the quasi-break-in system because it is cheap and easy. In their enthusiasm to simplify CW operation, the operators have devised the most complicated break-in systems. What ever happened to the simplified system, the ones you can throw together, adapt to any rig, have worked every time, and that don't take a week to build or install?

I came up with a simple design that would open and close the voltages to the transmitter when the operator wished to send CW.

Familiar to most, quasi-break-in is a system where the station stays in the receive mode until the operator desires to send the code via a key or keyer. Any tapping on the key causes the transmitter to switch into the transmit mode, and stay there a defined period after the last character is sent. This period of delay, before the transmitter is de-energized, is usually adjustable by the operator.

Since the quasi-break-in does not allow the operator to hear the other stations between his character sending, this is not a true break-in system. However, since the automatic transfer of power does occur with the first character sent via key, operation is speeded up. This is very desirable in operating a CW station. Quasi-break-in is a simple circuit and may be added to existing transmitters or designed into new ones. Since a power relay handles all of the high voltages in the transmitter it is safe to operate. Of course, the relay may be used also as an auxiliary switch for other relays.

Operation

Basically, the circuit works as follows: Diode D1 is used to protect the circuit from high voltages which may occur during key-up situations. D1 is reversed biased when the key is up. This allows capacitor C1 to become charged through resistor R1. This R1C1 time constant determines the variable delay of the circuit. This is the reason a variable resistor is connected in series with R1. Transistor Q1 is a voltage follower which isolates the charge on C1 from the rest of the circuit. Once the voltage on C1 reaches six volts, diode D2 is allowed to conduct. D2 is a 6V zener diode. No conduction takes place until at least 6V are across D2. The firing of D2 allows Q2 to turn on as current flows through D2 and the base of Q2. This causes Q3 to turn off,

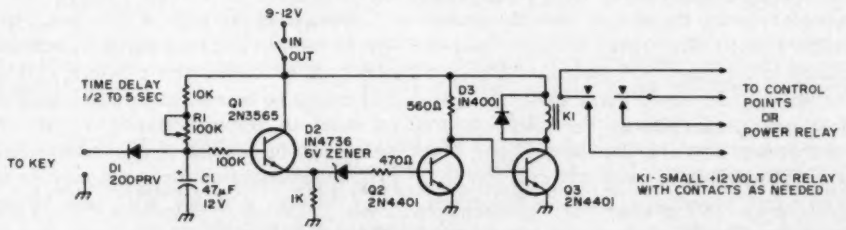


Fig. 1. Schematic of Quasi-Break-In system for use with cathode keyed transmitters.

— WE GOT 'EM —
CLEGG, COLLINS, DRAKE, SWAN, YAESU, TEN-TEC, and many more in stock. Large selection of used equipment. See us for quick courteous service. Established 1928.
FRECK RADIO & SUPPLY CO. Inc.
P.O. Box 7287 W4WL
Asheville NC 28802
704-154-9551
Est. 1921

want some?
quality – value
integrity – variety
fast ppd delivery
try TRI-TEK, INC.
10¢ Stamp for Latest Flyers Full of New and Surplus Electronics Bargains
P.O. Box 1888 • Phoenix, Arizona 85063

PL-259
SO-239
Either Plugs OR Sockets
5 for $3.50 POST-PAID
N.J. residents add 18c Sales Tax
Send SASE for other Connectors.
COAKIT P.O. Box 101-A, Dumont, N. J. 07628

Installation

If necessary, a small miniature relay may be used for K1 to control a heavy duty relay for transmitter switching. In my station, the necessary 12V was derived by rectifying the 6.3 vac filament lead. A large capacitor provided filtering. In case a high current relay coil causes chattering, the alternate relay controlling a relay method may be preferred. The relay contacts are used to turn off and on the B+ to the plates, control the antenna relay, control the receiver, etc.

I built my circuit on a small vector board mounting all components except the relay. The board was mounted on top of the transmitter chassis. The relay was then mounted under the chassis near the power supply circuits. The switch normally used to change to the transmit mode was rewired so the relay could also control these voltages. Wires were routed through the transmitter to connect the relay with the vector board. The delay potentiometer was mounted on the front panel, as well as a switch to disconnect Motorola 1N4736 but a substitute may work. One word of caution; diode D1 must have a high enough peak-reverse-voltage rating in order not to fail. Make sure the key-up voltage across the key terminals is less than the p.i.v. rating of this diode. Here again a low leakage diode should be used. opening relay K1 and the transmitter power circuits.

Once the key is closed, however, the voltage across C1 decreases to ½V, causing zener diode D2 to not conduct. This will in effect cause Q3 to conduct, turning on the relay as well as the transmitter. Once the key is up, charge is allowed to build up on C1, and when the voltage reaches 6V, the relay opens. Thus, a delay of R1C1 will occur after each key-up.

Transistor Q1 should be a high gain NPN. I used a 2N3565, but any small signal type should work equally well. Transistor Q3 should be able to handle the current of the relay. I used a 2N4401 which is able to switch about 500mA. Q2 is also non-critical. Diode D3 is used as transient protection for Q3 and must be installed correctly. Damage could result to Q3 otherwise. Zener diode D2 should have low leakage current. I used a power from the circuit. This allowed me to operate in the normal mode, i.e., with the quasi-break-in out of the circuit. Since the relay contacts parallel the main transmitter control switch, either switch or relay may be used to put the transmitter in the transmit mode. An extra set of contacts on the relay allows the receiver to be disabled during key-down periods.

As mentioned previously, the amount of time delay after sending code is determined by the R1C1 time constant. With the values shown, a delay range of ½ to 5 seconds was measured. More or less delay may be made by respectively increasing or decreasing the values of R1.

I have used this type of quasi-break-in for several months and have noted an increase in operating efficiency and pleasure. It is very convenient to be able to just tap on the key in order to transmit during a QSO. This circuit can be adapted to your transmitter at little expenditure of time or money. In fact, even Wayne probably has time between editorials to build it!

...WA5KPG

LETTERS

Continued from Page 22

SHAME ON W5JJ!!

W5JJ ought to have an FCC monitor permanently assigned on his lawn for such a travesty of an article appearing in your June 1974 (p. 33) issue.

Most of us have thought about such schemes, but who in his right mind (2 letter call, yet) would publish it for all newcomers and ole timers alike to fabricate from scratch?

At least a small diagram so newcomers would stay in the band! Assorted oscillators will appear with regenative tones modulating, sliding back and forth across commercial circuits, WWV and naturally TV. W5JJ proposes more power than hams with pride would use QRP!

K1CLL is a man after my heart with his thrown together circuits — deliver us from W5JJ, unfit for April CQ Magazine.

Shades of 1931, light bulbs coupled to an oscillating tank circuit! Please allow me to expose that which HF, VHF and UHF commercial folks have been using for years — the simple RHO 'tector as sold by Telonic, Texscan and Wiltron companies, to name a few.

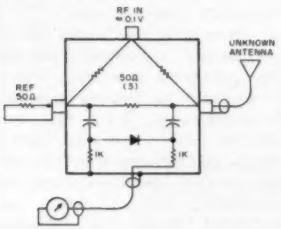


Fig. 1.

PARTS LIST

3 ea. 50Ω ¼ w (5%)
2 ea. 100pf ceramic capacitor
2 ea ≈1000Ω ¼ w
1 ea diode IN34,-82 etc.
1 ea Ref 50Ω (¼w) 5%
1 ea ≈100 Microamp meter

The circuit is a bridge — a 50Ω (or any pair of equal loads) on the unknown terminal will balance the 50Ω Ref load and the meter reads zero. Make other Ref loads of 100Ω, 150Ω etc., for VSWR check points of 2:1, 3:1 etc. Leave the unknown terminal unconnected and put in enough rf to read full scale on the meter; connect a 2:1 or 3:1 Ref. load and note the meter reading — a complex VSWR of same value will read at the same point.

Couple into the bridge with a grid-dip meter and move the dial slowly through the band of interest — band edges can be found quickly.

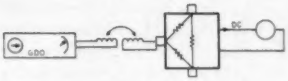


Fig. 2.

The Ref 50Ω can be built into the box with the other parts and save a connector and having to build a resistor into a mating connector. Built in meter makes it compact.

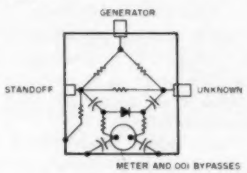


Fig. 3.

For those with a sweep generator — Heath TV alignment, B&K Precision, or other types sweeping over a wide range with a saturable reactor, are pretty good and available used — a 'scope gives a spectrum VSWR response.

Expanded scale measurements can be made if a standard mismatch (100Ω, 150Ω, 200Ω for 2:1, 3:1, 4:1) is used on the unknown terminal and the G.D.O. or signal generator is applied with enough voltage to give a full scale reading — then full scale is that ratio of the known (Ref) to the standard mismatch on the unknown terminal, i.e., 33Ω on Ref and 100Ω on unknown gives VSWR of 3:1 when set to full scale.

Write for data sheets from Texscan and an application note from Wiltron. Their devices for sale are in machined stainless steel with precision connections, but we homebrewers can live with phono connector, binding posts, BNC or other easy to connect devices. For BNC mount 3 of the chassis type UG-625 or UG-290 in a tight triangle to keep lead lengths to a minimum — the meter connector can be on an edge of the box. Photos of several homebrew versions on request.

Now, don't you think this is better than W5JJ suggesting that any available tube (813, 4PR60A etc.) be pressed into slapped together oscillator service?

Paul H. Sellers ex-K3IEW
Norfolk VA

REPLY

Thanks for forwarding the comment on my article! It's both amusing and enlightning to note the attitudes of persons when views or practices are voiced that do not coincide with their narrow preconceived concepts!

Please excuse my delay in commenting. As I'd told you, I'd planned to spend the summer and fall in Europe. But fate intervened. Instead, I went to a hospital for an operation on my spine and am just now getting able to sit in front of a typewriter. . .with my neck in a brace!

How does this chap ex-K3IEW know what power I used on my Hartley oscillator? (And why is he ex? Did he have a Lazy Liars License and get called in by the FCC to pass a real examination. . .and flunk?)

As a matter of fact, the power used was just slightly greater than that of the Measurements Corp. "Megacyclemeter" (a superior form of griddip meter sold for laboratory use) which had been used in some of the preliminary stages of the series of antenna experiments. The power radiated probably was within a dB of that of the "Megacyclemeter."

Also, I had used an "Antenna Noise Bridge" furnished to me by Ted Hart, the man who invented it and who holds the patents on it.

Both of these conventional devices functioned quite well until the stage of experimentation at which so much resistance was coupled into the antenna that neither could furnish a dependable indication. Then I dug out

the "Shades of 1931" that horrified ex-K3IEW. You know, Wayne, just because a technique has been known or available for many years is not an infallible indication of the utter worthlessness of the technique!

So it proved in this instance. The Hartley oscillator (built in 1929...not 1931) plus a simple lamp indicator performed what "state of the art" devices had failed to do: Indicate resonance on an antenna with high induced resistance.

As for the amazing techniques outlined as prime information by ex-K3IEW, are they in any manner different than those employed in common use by those who are aware of their sharp limitations? Not to mention by a much larger number of persons who are not aware of such limitations. It's the later group that comes up with some of the wild and totally baseless ideas about the performance of antennas and transmission lines.

In his bombastic effort to establish his omniscience, ex-K3IEW completely overlooked (or ignored) the one simple, basic principle: Keep it simple. An amateur who doesn't have access to a stack of laboratory equipment (or, in my case, even one who does) can make effective use of equipment on hand (or that can be built from any hellbox) to perform evaluative measurements.

Thank you, Wayne, for listening to my explanations.

Carl C. Drumeller W5JJ

ADS

Just a short note to say keep up the good work. I'm solidly behind you on your editorials and the format of 73 Magazine. One thing I would not like to see is a magazine cluttered with advertising like CQ and QST. In 73's case, I would rather pay a higher sub cost in the future than see more advertising in its pages.

W8WAT

We will try to keep the percentage of editorial to advertising high. The readers like it better and the advertisers receive better exposure...Wayne.

A BUILDER

You have the best amateur radio magazine. Bar none. I have built many projects and gear using the info from your magazine. Biggest and most successful has been the frequency counter designed by K2OAW. It works like a charm. Now for the reason I am writing to you on the November issue's jacket. You will find a copy of page 57 of the November issue. You can see that part of it is missing. The printer must have goofed. Please send me a good copy as part of the K2OAW up date on his counter is missing. By the way, I have almost completed the "Selective Calling Device" on pages 51, 52, 53 and 54 of the October issue of 73.

C.E. Showalter W4UJL

MODEST PROPOSAL

While reading the letters in a back issue of 73 on the scre..., ah incentives given us by the ARRL, I think I've come up with a fantastic solution.

Here goes: First, find a capable and responsible person to take over the publishing of 73 and retire (temporarily). Now, since there are some 280,000 amateurs in the U.S., and only about 80,000 belong to the ARRL, I'm sure at least 160,000 must be left to support you. So all 160,000 of us join the ARRL! Horrors! But wait, with 2/3 of the membership backing you, we can fire Huntoon and elect you as General Manager of the ARRL.

Once you have become supreme dictator, ah, general manager, you can get some things done that amateur radio vitally needs such as:

1. Establish a Washington lobby! In this day and age of politics it is insanity not to have one.

2. With the Washington lobby to pressure, that is make suggestions to, the FCC, establish a hobbyclass license for 220 with a basic theory and regulations exam but no code.

3. Shake QST loose and make it a competitive, and then maybe progressive magazine.

4. Restructure the ARRL into a more responsible, more representitive, progressive organization able to reflect the needs of present day amateur radio.

Now that you've advanced amateur radio and the ARRL fifty years, you can step down and return to 73 and publishing one hell of a fine magazine. Or maybe stay and run QST, whichever, you can count on me for vote #1.

Kevin L. Johnson WBØFGO

The incredible intelligence of our readers never ceases to amaze me...Wayne.

DOUBLE STUB TUNING SYSTEM

WA6CPP's double-stub tuning system (November 74) can be simplified by bringing the 180° of transmission line around into a circle and using only one sliding short. This may sound weird, but the short reflects any wave that reaches it (because it's a perfect mismatch) so no energy can travel past it. The sections on each side of the short form independent shorted stubs. Naturally, a low-resistance connection is important, so the joints should be either soldered or clamped tightly and protected from corrosion.

Doing that much gets rid of the "ganged" adjustment, making the matching procedure much easier, with no walking back and forth. However, it has also been pointed out in the past that a couple of wavelengths of high swr line between the antenna and the matching device cause no particular harm. The reflected energy just bounces back and forth in the mismatched section until most of it radiates. This means that enough half-wavelengths of line can be placed between the antenna and the first stub to place the short point at the bottom of the support structure, making the adjustment possible from the ground, or at most, a step ladder. Radiation from the extra open line can be minimized by twisting the line with a fairly short pitch.

John A. Carroll

SPECIAL BACK ISSUE OFFERINGS 2

Now you can build up your ham library for next to nothing!

PACKAGE A — *25 different issues (of our choice) for ONLY $5.00. That's just 20¢ an issue – it costs us more than that to print them! Choose from three different categories:*

Vintage: 1962-1965
Recent: 1966-1969
Very Recent: 1970-1973

PACKAGE B — *A complete set of 12 issues for a particular year for only $3.95. At only 33¢ an issue, you're still saving a bundle. Choose any year(s) from 1969-1973. Should we run out of a particular issue, you will receive a 50¢ credit.*

Great Gift Idea! — *Why not send the hams on your list a complete year of 73s in one of our handsome red binders with gold and black lettering. Special holiday price, $7.75. (The regular price of the binder alone is $5.00!) Come to think of it, why not give one to yourself?!*

BACK ISSUE OFFERS

***Please enclose $1.50 postage for *each* package ordered. (domestic)**

PACKAGE A ($5.00 EACH)

- ☐ Vintage: 1962 – 1965
- ☐ Recent: 1966 – 1969
- ☐ Very Recent 1970 – 1973

PACKAGE B ($3.95/year)

- ☐ year(s) _____
- ☐ with binders ($7.75 each) _____

Postage _____

Total Enclosed $ _____

HURRY WHILE OUR SUPPLY LASTS. ALL ORDERS ON A FIRST COME, FIRST SERVED BASIS.

Name _____ Call _____

Address _____

City _____ State _____ Zip _____

Caveat Emptor?

PRICE – $2 per 25 words for non-commercial ads; $10 per 25 words for business ventures. No display ads or agency discount. Include your check with order. Deadline for ads is the 1st of the month two months prior to publication. For example: January 1st is the deadline for the March issue which will be mailed on the 10th of February.
Type copy. Phrase and punctuate exactly as you wish it to appear. No all-capital ads.
We will be the judge of suitability of ads. Our responsibility for errors extends only to printing a correct ad in a later issue.
For $1 extra we can maintain a reply box for you.
We cannot check into each advertiser, so Caveat Emptor . . .

PORTSMOUTH RADIO CLUB requests help for Everett Reese WA8WIV completely burned out restaurant, home, all personal belongings. $60,000.00 loss and little insurance. Any financial help will be very much appreciated. Send all contributions to Portsmouth Radio Club c/o Trust Department, The Portsmouth Banking Company, P.O. Box 1151, Portsmouth, Ohio 45662.

STANDARD FM Equipment – Special huge discounts, 2M FM; 10 watt base/mobile SR-C 826MA $335 ppd. 2 watt handie talkie, SR-C 146A, crystals for 2 channels, $240. All brand new. Order now, write for catalog. Larger discounts on units of 3 or more. Bercom Electronics, P.O. Box 237, Bergenfield, NJ 07621.

WANTED: Make model and serial number of stolen ham gear for big list. W7UD, 3637 West Grandview, Tacoma Washington 98466.

COLLECTOR is interested in books, autographs and other information on early radiotelephone pioneers. Ronald Phillips, 1925 Baltimore, Kansas City, Missouri 64108. (816) 842-9009.

AMSAT/OSCAR 6-7 SLIDES – set of 5, $1.25 Lift-off and equipment Proceeds AMSAT. K6PGX P.O. Box 463, Pasadena, CA 91102.

WANTED: Hallicrafters SX-88 for parts, any condition considered. KØMNA, 4805 Sullivan, Wichita, Kansas. 67204.

STANDARD 146A – 3 months old, with 94/94, 34/94, 73/73, 25/85, 16/76, nicads, charger, rubber ducky and 2 whip antennae, external mike, 2 leather cases, $300.00. Mike Arseni, WA2WCB, 30-91 Crescent St., Astoria, New York 11102. (212) 626-7817, after 1800.

YOUR SWAP-N-SELL ads run free in TRADIO, a public service publication of Wichita Amateur Radio Society, Box 4391 Wichita Falls TX 76308.

FROM UNIVERSITY-Sound 4 C 15 W Woffers in unopened cartons. Retail $169 each. Will sell at $1.00 each. Write Cassette Headquarters, P.O. Box 482, Jaffrey, N.H.

NOW PAYING $2000.00 and up for ARC-94/618T, ARC-102/618T. $1200.00 and up for ARC-51BX. $1500.00 and up for 490T-1 antenna couplers. We also need these control boxes – C-6287/ARC-51BX, C-6476/ARC-51BX, C-714E-2. We also need R-1051 receivers, RT-662/Grc-106 transceivers. We buy all late aircraft and ground radio equipment. Also pack radios. We are buyers not talkers. Bring your equipment in, you are paid on the spot. Ship it in, you are paid within 24 hours. We pay all shipping charges. If you want the best price for your equipment, call us. Call collect if you have and want to sell or trade. We also sell. What do you needD&R Electronics, R.D. 1 Box 56, Milton PA 17847. Phone 717-742-4604. 9:00 AM-9:00 PM.

MOBILE IGNITION shielding gives more range, no noise. Everything from economical suppression kits to custom shielding, literature Estes Engineering, 543-A West 184 Street, Gardena CA 90248.

FOR SALE: Drake TR4, AC4, DC 4 $495.00. Knud E. M. Keller, Rt 12A Surry NH 03431.

FACSIMILE recorder, Times RD92AUX120, CV172 converter, excellent cond. with book, paper, $175. K. Bassett, 1124 Woodrow Waynesboro, VA 22980.

GE-VOICE Commander II with crystals on 94, charger, battery, case, book, excellent cond. $55 each (2). K. Bassett 1124 Woodrow, Waynesboro, VA 22980.

TRADE: Collins 75S3-B, 32S-3, 312B-4, 516F-2, mint round emblem, for Bendix R-1051B or URC-35 transceiver, (RT-618/URC and AN-3007/URT). Sid Sidman, 3571 Gresham Ct., Pleasanton, CA 94566.

FREE: 12 Extra crystals of your choice with the purchase of a new Regency HR-2B at $229. Send cashier's check or money order for same-day shipment. For equally good deals on Collins, Drake, Yaesu, Kenwood, Swan, Atlas, Standard, Clegg, Icom, Hallicrafters, Tempo, Ten-Tec, Venus, Alpha, Hy-Gain, CushCraft, Mosley and Hustler, write to Hoosier Electronics, your ham headquarters in the heart of the Midwest. Become one of our many happy and satisfied customers. Write or call today for our low quote and try our individual, personal service. Hoosier Electronics, R.R. 25, Box 403, Terre Haute IN 47802. (812) 894-2397.

WANTED: Tapetone converters for Model 345 Skysweep. Also NC 300 receiver. Bob Harmon, P.O. Box 751, Deming, New Mexico 88030.

GE PROGRESS Line portable on 94, internal charger, less battery, with book, $40. K. Bassett, 1124 Woodrow Waynesboro, VA 22980.

FREE: 12 Extra Crystals of your choice with the purchase of a new Regency HR-2B at $229. Send cashier's check or money order for same-day shipment. For equally good deals on Drake, Collins, Kenwood, Icom, Ten-Tec, Swan, Atlas, Alpha, Standard, Clegg, Genave, Tempo, Midland, Hy-Gain, Mosley, CushCraft, and Hustler, write to Hoosier Electronics, your ham headquarters in the heart of the Midwest. Become one of our many happy and satisfied customers. Write or call today for our low quote and try our individual, personal service. Hoosier Electronics, R.R. 25, Box 403, Terre Haute, Indiana 47802. (812) 894-2397.

TECH MANUALS – $6.50 each: R-220/URR, URM-25D, USM-159, USM-16, PRC-10. Thousands more available. Send 50¢ (coin) for large list. W3IHD, 7218 Roanne Drive, Washington DC 20021.

SIGNAL GENERATOR (measurements model 80) $200.00, also AC VTVM $20.00. Call 914 297-0557.

VERY INTERESTING! Next 5 big issues $1. "THE HAM TRADER," Sycamore, IL 60178. (Information about our "HAM EQUIPMENT BUYERS GUIDE" covering equipment 1945-75 included. Nostalgia! Helpful!)

SALE: 6M Gonset IV with approx. 12 dozen xtals. Excellent condition, $65.00. Utica 650 A 6M xcvr with VFO, includes mike. Excellent condition $50.00. Will consider trade for a low power SSB xcvr (or xmtr) or higher powered AM unit or will sell both for $100.00. John T. Carrigan, 601 Valley Ave., Apt. 105, Biham, Ala 35209, 205 870-5068.

TWO-METER FM ANTENNAS, 1/4; 5/8 W "Cartop"; and Fixed Station. Unique designs. Send for literature. Marsh Devices, P.O. Box 154, Old Greenwich, Connecticut 06870.

HELP Urgently needed Schematic for a custom frequency touch tone pad encoder for repeater use. Pete K. Hons, 614 Main, Portage, Pennsylvania 15946 814 495-4601.

TEST EQUIPMENT, receivers and builders items. R11 A-$4.00, R-15-$6.00 plus shipping. MX-2840-URR for R390A-$10.00 PPD. SASE for list. Lisaius, 116 Orton, Caldwell NJ 07006.

COLLINS 62-S-1 transverter wanted. $725 reward for one in mint electrical and mechanical condition. Bob Ewing, WA4GWG, Apt. 7-C, 2160 Hillsinger Rd., Augusta GA 30904.

SSTV. CRT's, 70 deg. yokes and focus magnets SASE to LOTZ-W5HCO, 750 Florida Blvd., New Orleans LA 70124.

SELL: R-390A-URR recvr good condition $450.00 Sy Kramer K2UFW, 212 320-2764, 120-8 Erskine Pl., New York NY 10475.

CALCULATOR OWNERS: Use your +-x÷ calculator to compute square roots, cube roots, trigonometric functions, logarithms, exponentials, and more! Quickly, accurately, easily! Send today for the IMPROVED AND EXPANDED EDITION of the First and best calculator manual – now in use throughout the world. . .still only $2.00 postpaid with unconditional money back guarantee! Mallmann Optics and Electronics, Dept. -E7, 836 South 113, West Allis, Wisconsin 53214.

JIG SAW PUZZLES wanted. If you have any old wooden jig saw puzzles in your attic – or run across them at an auction (they go for 25¢ usually), please keep in mind that Wayne Green collects them and might even pay a buck apiece for them. c/o 73 Magazine, Peterborough NH 03458. Wood, not cardboard – and complete.

SELL UNIQUE WIRE TUNER like new $45 Box 8352 Savannah, Georgia 31402.

CALL LETTER LICENSE PLATES – still being collected by 73 Magazine for possible cover use. Please send in an old call letter plate – most treasured are out-of-district plates such as W2NSD/NH, etc. Got any real oldies? 73 Magazine, Peterborough NH 03458.

ANTIQUE RADIO BUFFS. Do you need a schematic for your radio? For information send SASE showing make and model number. Joseph C. Crockett K3KUL, 762 S. Gulph Road, King of Prussia PA 19406.

MOTOROLA PORTABLES – Expert repairs, reasonable prices, fast turnaround time. More details and flat rate catalog FREE. Ideal Technical Services, 6663 Industrial Loop, Greendale, WI 53129.

TWO PLASTIC HOLDERS FRAME and display 40 QSL's for $1.00 or 7 holders enhance 140 cards for $3.00 – from your Dealer, or prepaid direct: TEPABCO, Box 198M, Gallatin, Tennessee 37066.

DAYTON HAMVENTION at HARA Arena April 25, 26, 27, 1975. Program brochures mailed March 10th. Write for information if you have not attended the last two years to HAMVENTION, P.O. Box 44, Dayton, Ohio 45401.

. . . *W2NSD from Page 3*

stations, on television and in the newspapers – talking it up on CB and at CB clubs.

5. Get all the publicity you can for amateur radio via club activities such as providing communications for walkathons, car rallies, parades – and be sure your club PR man has the story and pictures for the media. If a club member does anything outstanding in amateur radio be sure the story is written up for the papers and mention the club meetings.

6. Organize club events and make sure every scrap of publicity is gained from them. Hamfests, picnics, auctions, banquets, Field Day, VHF Contest group effort, other contest efforts by the club – all are good for publicity, which is the name of the game.

7. Improve meetings so newcomers will continue to come. Ruthlessly eliminate business meetings and have them run by the executive committee with nothing more than a short report. Eliminate the unnecessary trivia such as treasurer's report, other reports that can be done without. Get right down to an interesting speaker – into a short tech talk – show and tell on some gear built by a member – slides of a DXpedition – QSL card showing of some rare ones – demo of RTTY – of slow scan – Fax – talk on Oscar – 160m action – DX news – moonbounce – VHF SSB action – be sure every club member who has done anything of note gets an opportunity to brag about it.

8. Keep the club newspaper or bulletin lively. Start controversy at meetings and ask anyone interested to comment in writing to the club bulletin. Have the editor get the Hotline and thus have some hot news for each issue of your bulletin. Keep members up to date on DX scores of your serious DXers – DX scores of SSTVers – or RTTYers – certificate count of certificate hunters – etc. Put all that bragging into print to encourage others to compete – and more fun will be had by all. The club paper can help organize club contest efforts.

9. Since one of the factors which is considered important by the FCC as justification for amateur radio is emergency service, it is prudent for clubs to do what can be done to organize the members to be ready for emergencies. Repeater clubs have an advantage in this since they have such outstanding communications between members. Clubs should appoint Emergency Liason Officers who will be in charge when needed. These men should have at their fingertips everything they might need to do their job such as phone numbers of all other radio services in their community (police, fire, sheriff, CAP, highway, doctors, trucks, public service, etc.). They would do well to be licensed in as many of these services as possible and be able to intercommunicate with them for emergency purposes. They should have an inventory of emergency equipment such as generators, HTs, portable repeaters, available club members with mobile rigs, etc.

Continued on Page 136

CAN ARRL BE PRODDED?

The fact is that your club can get some action from the ARRL. They may be insensitive to individuals, but you may be sure that they listen when a club has something to say.

1. Get to know your ARRL director. Get him to your club and don't just listen to him talk, but insist on answers to problems, local, national and international. He is *your* representative and he *must* know the answers. Make sure your director is informed of the will of your club and insist on getting an answer back from him as HQ's response to this.

2. Your club can do a lot to initiate PR on a local level, but national PR is needed too and this means the ARRL since there are *no* other organizations to do this. Your club can be very insistent that ARRL does something concrete about this such as working up a series of television spots which hams at TV stations can urge management to run as often as possible. Some of these can be keyed to local clubs. Some can offer a pamphlet put out by your club. The League has vast resources to get national publicity.

3. Your club should discuss all FCC dockets and rules you want changed – and see that members send in comments – that the club sends in its own comments – with copies to your director and feedback later from him as to HQ action in the matter. All club members should be well informed on all aspects of rules changes and should know where the ARRL stands on these items.

4. Since amateur radio hinges entirely on the International Telecommunications Union (ITU) in Geneva your club should know exactly what is being done by the ARRL to prepare for the proposed 1979 ITU Conference. You should insist on knowing what the League is doing with the $100,000 fund the directors set up to fight for amateur frequencies – and what they have done with it in the past – accept no double talk. Your money is involved and you have a right to know exactly what it has been, is, and will be used for. Obviously the results of the ITU Conference hinge on the attitude toward amateur radio of the so-called Third World nations. This means that your director should be reporting on the actions of HQ in contacting these countries and the results of these meetings. Perhaps your club can help with things like this by setting up a liaison with some small country and sending surplus equipment – callbooks – ham magazines and books. The League can set up these liaisons through your director. Be sure your club gets reports on what ITU nations are proposing for changes in the amateur bands – these proposals are made many months to years before the conference so delegations will be able to coordinate with each other. U.S. amateurs should be informed on what Germany, England, Australia, India and other countries are proposing to do with the amateur bands.

5. Since it is difficult for everyone to keep in touch with what is going on with the ARRL it might be prudent to have someone in your club appointed as an official liaison between the director and the club – someone who will take the time to read the fine print in QST – get the official bulletins – keep track of what the League is doing on various FCC dockets – of what they are doing with the ITU and contacts with other countries preparatory to the ITU conference – keep track of the quality of the representation of your division ARRL director – keep track of ARRL elections – and report at each club meeting what is going on – who is running for office and what their qualifications are – what has been or has not been happening at HQ – what response he has had from the director on club positions on dockets and other amateur matters – etc. This liaison should get the various ham newsletters, the ham magazines, and all mailings from the ARRL, including director letters.

...Wayne

GRR & GRRREEN

Continued from Page 160

if they don't pay, just to prove that they can.

Since the editorial asked at the end if members want QST to continue with this practice, there is some suspicion that they might use a response from the readers as an excuse to change this policy.

One prominent mail order advertiser who claims that his QST ads have not pulled well at all was particularly furious. He wrote a blistering letter to us (he advertises very successfully in 73) pointing out that on page 166 of that very same issue of QST they ran an ad for Dycomm, so who did they think they were fooling with their sanctimonious act? He enclosed a review of the Dycomm amplifier from the Mid-Oklahoma Repeater Newsletter which said, "It has generally been conceded that the Dycomm Super D amplifier should be categorized as a Super Dud. In addition, you should learn to attempt to tune a Dycomm amplifier. One of the brightest technicians who works on commercial equipment every day undertook such an effort with the consequences that the final transistors blew out. This has been known to happen even if you weren't tuning the amplifier! Also, Dycomm must get their power ratings for their amplifiers from a Captain Marvel Comic book because they border in the realm of science fiction. A problem this editor had with a Dycomm amplifier ended with a couple of nice letters to the manufacturer explaining the problem over what apparently had been a mistake between the dealer that the amplifier was purchased from and the manufacturer. The amplifer was repaired (at a cost) and returned and a small note included saying that the problem was in the private dealings between me and the *amateur* I bought it from. Apparently Dycomm dealers are not dealers, but just people who pass this garbage to an unsuspecting amateur population and your only remedy would be to sue your friendly dealer. Objectively, some people have had success with this equipment and had few problems, but I have yet to see one that meets the power specifications advertised. You would do much better to buy a KLM or TPL or other. A threat of legal action brought a response from Jim Penhy (who seems to be the president, engineer, technician and shipping clerk) saying that he would exchange the amplifier for another for only $50 more! Should I throw good money after bad?"

Just recently we received a good comment on a Dycomm repeater, so all is not a total loss. Our experience with Dycomm repeaters was extremely bad at 73 – and many of the repeater groups we talked with who had tried them were very disillusioned. It seems unlikely that QST has not had at least some of the letters of complaint on the Dycomm amplifiers – many have been received at 73 – yet QST continues to carry the Dycomm ads. Odd. But then they continue with the Trigger ads too, even after CQ published quite a terrible letter about Trigger.

...Wayne

John Boojamra W2BJB
55 Winthrop Street
Brooklyn NY 11225

QUICK CAP

Very small capacitors made from twisted hook-up wire are often not stable enough; one has to snip away until he hits the right capacity – he hopes. This gimmick uses a double fluted plastic coffee stirrer, into which #14 wire fits snugly to form the plates of a capacitor. When checked out on a General Radio Q-meter, it was found to be linear throughout: 1 pF per inch. Need a 3 pF capacitor? Just cut off 2" from one end!

. . . W2BJB

Cash for any Collins military or commercial equipment or parts, especially 618T transceivers. Will trade some Collins. AN/APQ-102, AN/ARC-94, AN/MRC-95. SPACE ELECTRONICS CO., [illegible] 07[illegible] 227-7[illegible]

CASH

LOOKING FOR A NEW CHALLENGE?
... then build a TV camera!
ONLY SOLID-STATE CAMERA AVAILABLE IN KIT FORM OR FACTORY ASSEMBLED COMPLETE KIT WITH VIDICON TUBE ONLY $166.00 POSTPAID DELIVERY ANYWHERE IN USA, CANADA, and MEXICO. OPTIONAL AUDIO SUBCARRIER $18.95. WRITE or PHONE NOW FOR COMPLETE CATALOG OF KITS, PARTS and PLANS. DIAL 402-987-[illegible]
1301 N. BROADWAY ATV Research DAKOTA CITY, NEBR. 6[illegible]

MINIATURE SUB–AUDIBLE TONE ENCODER
- Compatible with all sub-audible tone systems such as Private Line, Channel Guard, Quiet Channel, etc.
- Glass Epoxy PCB, silicon transistors, and tantalum electrolytics used throughout
- Any miniature dual coil contactless reed may be used (Motorola TLN6824A, TLN6709B – Bramco RF-20)
- Powered by 12vdc @3ma
- Use on any tone frequency 67Hz to 250Hz
- Miniature in size 2.5x.75x1.5" high
- Wired and tested $14.95
- Complete less reed (Available in 33 freqs. for $17.50 ea)
- Output 3v RMS sinewave, low distortion
- Postpaid – Calif. residents add 5% sales tax

COMMUNICATIONS SPECIALISTS
P.O. Box 153, Bree CA 92621

Serving All New England

FR-101 Digital
SOLID-STATE RECEIVER
- Total coverage capability: 160 thru 2 meters + 12 major S.W. bands.*
- Direct frequency readout to 100Hz.
- Provision for all-mode reception: SSB, CW, AM, RTTY & FM.**
- Reliable, plug-in, modular circuitry.
- Compatible transceive operation with 101 series.

With the Hottest Line Going!
Yaesu
Yaesu
Yaesu

FL-101
SOLID-STATE TRANSMITTER
- 240 Watts PEP.
- 160 thru 10 meter coverage + 2 optional auxiliary bands.
- All-mode operation: SSB, CW, AM & FSK.
- Reliable, plug-in, modular circuitry.
- Provision for RF speech processor.

Let Howard and The Gang at Adirondack Serve Your Needs

Overnight UPS Delivery

ADIRONDACK RADIO SUPPLY, INC.

Master Charge BankAmericard

185 W. Main Street Amsterdam NY 12010 Phone: (518)842-8350

73 gift gallery

DIGITAL CONTROL OF REPEATERS
softbound $5 hardbound $7

Here's a book for the FMer who wants to design and build a digital repeater control system. Contains sections on repeaters, basic logic functions, logic circuit design, control systems, support circuits, mobile installations, touch-tone, plus a special section on a "mini" repeater control system.

4 STUDY GUIDES
NOVICE — $4 GENERAL — $6
ADVANCED — $4 EXTRA — $7

FCC exams got you scared? Frustrated by theory fundamentals? There's no need to worry. 73's four License Study Guides will help you breeze through any of the four tough exams! They are the ONLY guides which cover ALL the material you will have to know. Many amateurs find that one quick reading through our guides is enough to get them through with no sweat.

INTRODUCTION TO RTTY
$1

In this book the world of radio-teletype is explained in an easily understood manner for the beginner.

The last part of this book contains a bibliography of everything published about RTTY since 1952.

RTTY HANDBOOK
$6

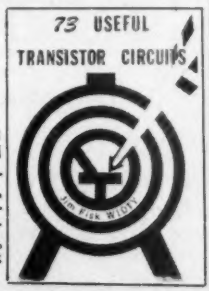
A comprehensive book covering all areas of radio teletype, from getting started with the basic principles, what equipment to procure and how to make it work.

DIODE CIRCUITS HANDBOOK
$1

115 diode circuits including power supply application, regulators, ac meter applications, receiver detectors for AM-FM-SSB, noise limiters, squelch, AGC, varicap tuning, audio clippers.

FM REPEATER CIRCUITS MANUAL
hardbound $7
softbound $5

Contains almost every conceivable circuit that might be needed for use with a repeater. All circuits explained in detail. All aspects covered, from the operator to the antenna.



73 USEFUL TRANSISTOR CIRCUITS
$1

Useful transistor circuits for audio, receivers, transmitters and test equipment. 47 chapters with circuit diagrams for each, complete with component values, etc.

VHF PROJECTS FOR AMATEUR AND EXPERIMENTER

$5

A must for the VHF op. Opening chapters on operating practices and getting started in VHF, both AM and FM, followed by 58 chapters on building useful test equipment, modifying existing and surplus gear.

SOLID STATE PROJECTS

$4

More than 60 projects of interest to anyone in electronics. The devices range from a simple transistor tester to a ham TV receiver. This collection will help you become more intimately acquainted with zeners. ICs and varactors, etc.

TRANSISTOR PROJECTS

$3

Crammed full of home construction projects, from receivers to transmitters and all in between. Chapters include such articles as zener diodes, how they work, how to use, test and buy them; integrated circuits; how to design transistor amplifiers; and many more.

VHF ANTENNA HANDBOOK

$3

Would you believe that the secret to success in VHF/UHF is in the antenna system? This is no earth shaking discovery, but it's true. A complete, detailed book with descriptions, dimensions, tuning data, diagrams and photos.

DX HANDBOOK with MAP

$3

How to work DX, how to get QSLs, country lists, award lists, QSL bureaus, maps of the world, great circle maps centered on major U.S. cities. Wall size DX map of the world included.

SLOW SCAN TELEVISION HANDBOOK

hardbound $7

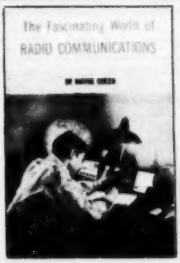
softbound $5

This excellent book tells all about it, from its history and basics to the present state-of-the-art techniques. Contains chapters on circuits, monitors, cameras, color SSTV, test equipment and much more.

COAX HANDBOOK

$3

All about coaxial cables, connectors and applications. It's all here — pictures, part numbers and specifications for all types. Includes lengths for different types for quarter, half and full wave feedlines.



FASCINATING WORLD OF RADIO COMMUNICATIONS

$4

All about broadcast band DXing, tuning the tropical DX bands, DXing radio amateurs, antennas for shortwave, radio licenses, pioneers in electricity and radio, commercial broadcast stations, WWV, etc.

TVI

$1.50

Discusses all types of interference problems in great detail with recommended steps to cure these problems. Good for both the amateur and citizens band operator. Try this cure and suffer no longer.

73 CERTIFICATES WAAS **$1**

Worked Almost All States — Proof of your having worked 49 of the 50 states.

ALL MODE DXDC **$1**

An award for 2-way communications with 10 countries using CW-SSB-RTTY-SSTV modes.

DXDC **$1**

Available for those who present proof of contact (copy of log) with 10 different countries.

SSTV-DXCC **$1**

For 2-way Slow Scan Television communications with 10 countries.

LAPEL BADGES

$1

Name and call identifies you at club meetings, hamfests, busted pot parties. Hand engraved by skilled New Hampshire craftsman with loving care.

RTTY-DXDC **$1**

All operating award for those who have submitted proof of 2-way teletype communications with 10 countries.

CUSTOMIZED DX BEARING CHART

$4

An amateur who works for a big computer company has a program which permits him to plug in your location and have it print out the bearings of all the countries of the world from your shack.

73 BINDERS

$5

These binders are a gorgeous red and come with the nicest set of year stickers you've ever seen. The perfect thing for storing your issues of 73 so that they won't get lost or spilt on, or into the hands of the Jr. Op. Dress up your shack with these binders.

WORLD DX MAP

$2

This is the same wall-sized DX map that is included with the DX Handbook except it comes to you rolled up instead of folded. This is so you can put it on the wall or have it framed.

CALL LETTER DESK PLATE

$2

How about dressing up your operating table with a desk plate showing your first name and call? These embossed desk plates are nice — and inexpensive. No zero available, sorry. There is room for twenty letters and spaces total.

U.S. MAPS

$1

These wall sized maps show the states and call area. They are specially designed for coloring to show your progress toward the Worked All States award of ARRL. They come in groups of four.

73 gift gallery

73 Magazine, Peterborough NH 03458

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

SEND ME: PRICE

_____ _____

_____ _____

_____ _____

_____ _____

SIGNATURE _____

CARD # _____

EXPIRATION DATE _____ TOTAL _____

☐ master charge ☐ BANKAMERICARD ☐ CHECK

HOW TO SAVE $20
in one easy lesson

Wouldn't you like to save yourself $20.00? Of course you would! Want to know how to do it? Here's the plan.

Step #1: Send in your sub to 73 for $16.
Step #2: Have 73 delivered to your door for 36 months.
Step #3: Deposit the $20 you've just saved in the bank.

Now isn't that simple? You're reading 73 Magazine right now, so we don't have to tell you what a great magazine it is. You have the proof right in your hand. You can see for yourself that 73 has:

TWICE as many feature articles
TWICE as many construction projects
50% MORE ads
50% MORE shopper's bargains
The MOST concise news reports available
The ONLY circuits circuitry pages

73 gives you MORE of everything you buy a ham magazine for. And by subscribing, you save $20 – and that's a whopping 56% SAVINGS over the newsstand cost!

Go ahead – make the easiest twenty bucks of your life – subscribe to 73 TODAY!

Name _____ Call _____

Address _____

City _____ State _____ Zip _____

□ 3 years $16
□ 1 year $8

□ check enclosed
□ bill me

Mail today to 73 Magazine, Peterborough NH 03458.

INTERNATIONAL ELECTRONICS UNLIMITED

MICROPROCESSORS

IEU is making available for the first time anywhere an extremely versatile 16 bit microprocessor kit. The basic kit includes all necessary components to build a 16 bit microprocessor. Optional memory boards are available allowing possible expansion of the basic system to microcomputer or minicomputer proportions.

Basic Kit Includes: **PRICE (basic kit) $349.50**

A printed circuit boards (compatible with 22 pin edge connectors – not supplied)
B microprocessor chip set
C gates, interface elements, clock drivers, etc.
D transistors, diodes, capacitors
E 75 page data package which includes an introduction to microprocessors, all necessary data sheets and extensive data on the workings and applications of microprocessor chips.

Available Options

1 power supply component pkg.
2 memory board #1 (employs 1101 rams)
3 memory board #2 (employs 1101 rams and 5203 erasible PROMS)

Basic Data Package

available separately
refundable with purchase of basic kit $5.00

TTL

7400	$ .19	7485	$1.39
7401	.19	7486	.44
7402	.19	7489	2.75
7403	.19	7490	.76
7404	.22	7491	1.20
7405	.22	7492	.79
7406	.39	7493	.79
7407	.39	7494	.89
7408	.25	7495	.89
7409	.25	7496	.89
7410	.19	74105	.49
7411	.29	74107	.49
7413	.79	74121	.57
7415	.39	74122	.53
7416	.39	74123	.99
7417	.39	74125	.69
7420	.19	74126	.79
7422	.29	74141	1.23
7423	.35	74145	1.15
7425	.39	74150	1.09
7426	.29	74151	.89
7427	.35	74153	1.29
7430	.22	74154	1.59
7432	.29	74155	1.19
7437	.45	74156	1.29
7438	.39	74157	1.29
7440	.19	74161	1.39
7441	1.09	74163	1.59
7442	.99	74164	1.89
7443	.99	74165	1.89
7444	1.10	74166	1.65
7445	1.10	74173	1.65
7446	1.15	74175	1.89
7447	1.15	74176	1.65
7448	1.15	74177	.99
7450	.24	74180	1.09
7453	.27	74181	3.65
7454	.39	74182	.89
7460	.19	74190	1.59
7464	.39	74192	1.49
7465	.39	74193	1.39
7472	.36	74194	1.39
7473	.43	74195	.99
7474	.43	74196	1.85
7475	.75	74197	1.15
7476	.47	74198	2.19
7483	1.11	74199	2.19

Data sheets supplied on request
Add $.50 for items less than $1.00

CMOS

74C00	$.39	74C154	3.50
74C02	.55	74C157	2.19
74C04	.75	74C160	3.25
74C08	.75	74C161	3.25
74C10	.65	74C163	3.25
74C20	.65	74C164	3.50
74C42	2.15	74C173	2.90
74C73	1.55	74C195	3.00
74C74	1.15	80C95	1.50
74C76	1.70	80C97	1.50

4000 SERIES RCA-EQUIV.

CD4001	$ .55	CD4017	2.95
CD4009	.85	CD4019	1.35
CD4010	.85	CD4022	2.75
CD4011	.55	CD4023	.55
CD4012	.55	CD4025	.55
CD4013	1.20	CD4027	1.35
CD4016	1.25	CD4035	2.85

LINEAR CIRCUITS

301	Hi perf. op amp	mDIP	$ .32
307	Op amp	mDIP	.35
308	Micro-pwr op amp	mDIP	1.10
309K	5V reg 1A	TO-3	1.65
310	V follr. Op Amp	mDIP	1.19
311	Hi perf. V comp	mDIP	1.05
319	Hi-speed dual comp	DIP	1.29
320	Neg. regulator (5V,5.2V,12V,15V)	TO3	1.35
324	Quad op amp	DIP	1.95
339	Quad comp	DIP	1.69
340T	Pos V reg (5V, 6V, 8V, 12V, 15V, 18V, 24V)	TO-220	1.95
372	AG-IF strip det	DIP	.79
376	Pos V reg	mDIP	.59
377	2 w stereo amp	DIP	2.69
380	2w audio amp	DIP	1.49
380-8	.6w audio amp	mDIP	.89
381	Lo noise dual preamp	DIP	1.79
550	Prec. V reg	DIP	.79
555	Timer	mDIP	.99
560	Phase locked loop	DIP	2.75
562	Phase locked loop	DIP	2.65
565	Phase locked loop	DIP	2.65
566	Function gen	mDIP	2.75
709	Op amp	DIP	.29
710	Hi speed V comp	DIP	.39
723	Volt reg.	DIP	.69
739	Dual hi perf amp	DIP	1.19
741	Comp. op amp	mDIP	.35
747	Dual 741	DIP	.79
748	Freq adj 741	mDIP	.39
1304	FM mux st demod	DIP	1.19
1307	FM mux st demod	DIP	.82
1458	Dual Comp op amp	mDIP	.69
3900	Quad amp	DIP	.65
3905	Prec. timer	DIP	.65
7524	Core mem sense amp	DIP	1.89
7525	Core mem sense amp	DIP	.95
7535	Core mem sense amp	DIP	1.25
75451	Dual prl. driver	mDIP	.39
75452	Dual prl. driver	mDIP	.39
75453	Dual prl. driver	mDIP	.39
75491	Quad seq driver	DIP	.79
75492	Hex dig. driver	DIP	.89

Data sheets supplied on request
Add $.50 for items less than $1.00

CALCULATOR & CLOCK CHIPS w/data

5001	12 DIG 4 funct fix dec	3.95
5002	Same as 5001 exc btry pwr	7.95
5005	12 DIG 4 funct w/mem	8.45
MM5725	8 DIG 4 funct chain & dec	2.79
MM5736	18 pin 6 DIG 4 funct	4.95
MM5738	8 DIG 5 funct K & Mem	7.95
MM5739	9 DIG 4 funct (btry sur)	6.95
MM 5311	28 pin BCD 6 dig mux	6.95
MM 5312	24 pin 1 pps BCD 4 dig mux	6.95
MM 5313	28 pin 1 pps BCD 6 dig mux	7.95
MM 5314	24 pin 6 dig mux	8.95
MM 5316	40 pin alarm 6 dig	8.95

FEBRUARY SPECIALS

8008	8 bit C.P.U. – prime quality factory marked & guaranteed	$64.50
2102	N channel 1024 Bit Static RAM	$ 7.95
930	Dual 4 input gate w/exp	$ .10
936	Hex inverter	.10
937	Hex inverter	.10
311	Hi perf volt comp mDIP	.89
322	Prec timer. Operates on unreg supply 4.5-40v	1.59
709	Op amp	.21
739	Dual hi perf op amp	.99
40411	Audio pwr amp	3.40
40594	Audio driver	1.33
40595	Audio driver	1.49
2N2219A	Audio-UHF amp/sw	.89
5001	12 dig calculator chip	3.39
5312	4 dig clock chip	5.25
7404	Hex inverter	.18
7410	Triple 3-input NAND gate	.16
7420	Dual 4-input NAND gate	.16
7437	Quad 2-input NAND buffer	.29
7440	Dual 4-input buffer	.17
7445	BCD–dec dcdr-drvr	.90
7489	64 Bit RAM	2.35
7490	Decade counter	.69
74154	4-6 line dcdr demux	1.19
74181	Aritmetic logic unit	2.95
74L00	Quad 2 input gate (l.p.)	.27
74L74	Dual D flip flop (l.p.)	.49
MAN1	Red 7 seg LED	2.19
MCT2	Opto iso trans	.59

ALL DUAL-IN-LINE

MEMORIES

1101	256 bit RAM MOS	$1.75
1103	1024 bit RAM MOS	4.95
5203	2048 bit eras. PROM	24.95
5260	1024 bit RAM low power	3.95
7489	64 bit RAM TTL	2.75
8223	Programmable ROM	4.95
74200	256 bit Ram-tri-state	7.95

LED'S AND OPTO ISOLATORS

MV10B	Red TO 18	$ .25 ea.
MV50	Axial leads	.20
MV5020	Jumbo visible red	.33
ME4	Infra red diff. dome	.60
MAN1	Red 7 seg. .270"	2.50
MAN2	Red alpha num .32"	4.95
MAN3A	Red 7 seg. .127"	.79
MAN3M	Red 7 seg. .127" claw	1.15
MAN4	Red 7 seg. .190"	2.15
MAN5	Green 7 seg. .270"	2.95
MAN7	Red 7 seg. .270"	1.35
MAN8	Yellow 7 seg. .270"	3.95
MAN66	60" high dir. view	4.65
DL707	Red 7 seg. .3"	2.15
MCT2	Opto-iso transistor	.89

(408) 659-4773

ON ORDERS OVER $25.00 DEDUCT 10%

All items are new, unused surplus parts – tested functional. Satisfaction is guaranteed. Shipment will be made via first class mail – postage paid – in U.S., Canada and Mexico within three days from receipt of order. Minimum order – $5.00. California residents add sales tax.

INTERNATIONAL ELECTRONICS UNLIMITED
P.O. BOX 1708 MONTEREY, CALIF. 93940 USA

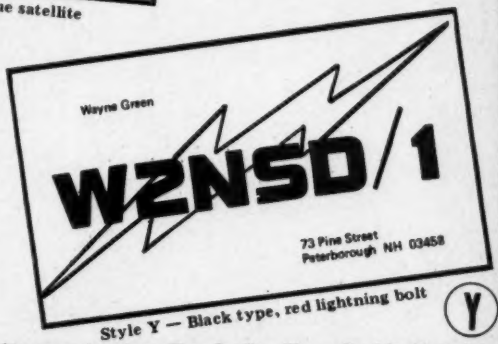
BRAND NEW QSLs

- two styles
- QSO info back
- two colors
- LOW PRICES

X

Style X — Black type, blue satellite

While the cost of everything continues to skyrocket, 73 has STILL kept the price of these beautiful QSLs at absolute rock bottom. When we started selling our top quality QSLs two years ago at a PENNY-A-PIECE it was a great deal (postpaid no less!). When we held that price firm last year against all obstacles, it became a fantastic opportunity. Now, this year we're STILL HOLDING DOWN THE PRICES and it's the next best thing to having your very own oil well! And with two brand new designs too!



Style Y — Black type, red lightning bolt

Y

ORDER — AND PAY
250 . . . . . $6 (2.5¢ ea)
500 . . . . . .$10 (2¢ ea)
1000 . . . $15 (1.5¢ ea)
2000 . . . . . .$20 (1¢ ea)

These QSLs are printed on *Fine Quality Glossy Card Stock* and are as good or better than cards sold elsewhere for several times the price. We can offer this fantastic low price, because we "gang print" orders between other jobs in our own print shop which keeps the costs way down and we pass the savings on to you. If you haven't been QSLing as much as you'd like to because of the cost of cards, do you really have an excuse anymore? Get some cards and help improve the image of U.S. Amateurs.

Name _____ Call _____
(First and last name is most friendly)

Address _____
(as brief as possible and still get through the mail)

City _____ State _____ ZIP _____ (a must) County _____ (if desired on the card)

Style
X ◯
Y ◯

Awards to be listed on card _____ (if desired)

☐ 250 ☐ 500 ☐ 1000 ☐ 2000 cards

Foreign Orders: Add following amounts for shipping and handling. (Parcel Post)

250 — $1.75 500 — $2.25 1000 — $4.00 2000 — $6.25

Check local Post Office for air rates . .

Amount enclosed $_____

A product of 73 Magazine, Peterborough NH

2 METER FM HEADQUARTERS

NEW extended hours convenient location at ERICKSON COMMUNICATIONS

only **STANDARD** sells more STANDARDS than Erickson...and here's why

ERICKSON SPECIAL !
SRC-146A with

- *Charger*
- *"Stubby" antenna*
- *Leather case*
- *Ni-Cads*
- *94/94, 34/94 and one channel of your choice*

List Price: $369.00
YOU SAVE: 50.00
YOUR PRICE: only $319.00

Shipped prepaid for cashier's check or M.O.

SYNTHESIZED !

Inoue's New
IC-230

- 162+ channels, simplex or offset (600 kHz) for repeaters
- All modular construction
- Super hot MOSFET/helical coil .4μV receiver
- AVAILABLE NOW ! . . . only **$489.00**

TEMPO SOLID-STATE POWER AMPS

U.S. Made

MODEL	DRIVE POWER	OUTPUT POWER	PRICE
1202	5-25 watts	100-135 watts	$228
1202B	1-2.5 watts	120-130 watts	$239
802	5-12 watts	70-90 watts	$190
802B	1-2.5 watts	80-90 watts	$195
502	5-15 watts	35-55 watts	$110
502B	1-2.5 watts	45-50 watts	$130
302	1-2.5 watts	30-35 watts	$93
152	1 watt	15 watts	$59

And many more from SBE/Clegg/ICOM/Kenwood/Tempo/Antenna Specialists/Larsen

Make ERICKSON your headquarters for all your FM needs . . .
SEND QSL FOR COMPLETE SPECIFICATIONS

ERICKSON COMMUNICATIONS

4135 Main Street Skokie, IL 60076 (312) 677-2161
Extended hours: Days 9 – 4:30, Monday through Saturday; Evenings 6:30 – 9, Monday, Thursday, Friday

NEW CODE SYSTEM

Now you can learn the code in a fraction of the time it used to take!

four speeds available

Plays on any cassette player so you can practice anywhere anytime!

☐ **5 WPM** This is the beginning tape for people who do not know the code at all. It takes them through the 26 letters, 10 numbers and necessary punctuation, complete with practice every step of the way using the newest blitz teaching techniques. It is almost miraculous! In one hour many people — including kids of ten — are able to master the code. The ease of learning gives confidence to beginners who might otherwise drop out.

☐ **14 WPM** Code groups again, at a brisk 14 per so you will be at ease when you sit down in front of the steely eyed government inspector and he starts sending you plain language at only 13 per. You need this extra margin to overcome the panic which is universal in the test situations. When you've spent your money and time to take the test you'll thank heavens you had this back breaking tape.

☐ **6 WPM** This is the practice tape for the Novice and Technician licenses. It is made up of one solid hour of code, sent at the official FCC standard (no other tape we've heard uses these standards, so many people flunk the code when they are suddenly — under pressure — faced with characters sent at 13 wpm and spaced for 5 wpm). This tape is not memorizable, unlike the zany 5 wpm tape, since the code groups are entirely random characters sent in groups of five. Practice this one during lunch, while in the car, anywhere and you'll be more than prepared for the easy FCC exam.

☐ **21 WPM** Code is what gets you when you go for the Extra Class license. It is so embarrassing to panic out just because you didn't prepare yourself with this tape. Though this is only one word faster, the code groups are so difficult that you'll almost fall asleep copying the FCC stuff by comparison. Users report that they can't believe how easy 20 per really is with this fantastic one hour tape. No one who can copy these tapes can possibly fail the FCC test. Remove all fear of the code forever with these tapes.

ONLY $3.95! 73 is in the publishing business, not tapes, so these are priced much lower than anyone else could sell them. Have you ever seen one hour cassettes for under $6?

ORDER NOW!

Name _____ Call _____

Address _____

City _____ State _____ Zip _____

☐ 5 WPM 1 hr cassette $3.95 ☐ 14 WPM 1 hr cassette $3.95
☐ 6 WPM 1 hr cassette $3.95 ☐ 21 WPM 1 hr cassette $3.95
☐ all four cassettes $13.95

73 Magazine — Peterborough NH — 03458

DuPage FM

WILL NOT BE UNDERSOLD!

MOTOROLA

MOTRACS: U43HHT 152-172 mc. 30 watts output, solid state receiver. With accessories.
Single frequency $240.00
Two frequency (if available) Tx $260.00
U63HHT 152-172 mc. 80 watts output, solid state receiver. With accessories. Two frequency $350.00
(Motrac quantities are limited, first come, first served.)

MOTORCYCLE RADIOS: D33AAT 152-172 mc, 10 watts output, solid state power supply. Front mount, less mike . . . . . $ 40.00
T33AAT 152-172 mc, 10 watts output, solid state power supply, rear mount with head and cables . . . . . $ 45.00

PORTABLES: H21AAC-1½ W output, dry battery supply (less battery) 30 to 50 mc 25.00
P31AAC 5 watts output, dry battery supply (less battery) 30 to 50 mc $ 30.00

GENERAL ELECTRIC

TPL's (TRANSISTORIZED PROGRESS LINE). All TPL's have solid state receiver and exciter and have 3 or 4 tubes in the transmitter.
100 watts output in the 30 to 50 mc band, two frequency, with a NOISE BLANKER. Less accessories. RE72JB3 . . . . . $300.00
Accessories for above . . . . . $ 35.00
100 watts output in the 30 to 50 mc band, less accessories, TE72JA3 . $225.00
Accessories for above . . . . . $ 35.00
80 watts output in the 152-173 mc band, less accessories $200.00
Accessories for above . . . . . $ 35.00

PROGRESS LINES: 6/12 volt vibrator supply.
MA/E 13N 30 watts output in 30 to 50 mc band, with accessories for trunk mount, FULLY NARROWBANDED . . . . . $ 65.00
FA/E 16N 60 watts output in 30 to 50 mc band, with accessories for front mount, FULLY NARROWBANDED . . . . . $ 85.00
MA/E16 60 W output in 30 to 50 mc band, w/accessories for trunk mount $190.00
MA/E 33 30 W output in 152-172 mc band, w/accessories for trunk mount $75.00

PROGRESS LINES: 12 volt transistor power supply MT-42N 15 watts output in 450-470 mc band, with accessories for trunk mount (narrowbanded) . . . . . $ 60.00
MT-13N 30 watts output in 30 to 50 mc band, with accessories for trunk mount, FULLY NARROWBANDED $100.00
MT-16N 60 watts output in 30 to 50 mc band, with accessories for trunk mount, FULLY NARROWBANDED $130.00

Quantities are limited on some items so send your check or money order today to

DU PAGE FM Inc.

P. O. Box 1, Lombard IL 60148, (312) 627-3540

TERMS: All items sold as is. If not as represented return for exchange or refund (our option) shipping charged prepaid within 5 days of receipt. Illinois residents must add 5% sales tax. Personal checks must clear before shipment. All items sent shipping charges collect unless otherwise agreed. Accessories do not include crystals, relay or antennas.

ANTENNAS • RADIOS • SCANNERS • GOODIES
TV CAMERAS • VIDEO TAPE AND RECORDERS • MONITORS

In stock: Icom, Standard, CushCraft, Hy-Gain, A/S, Motorola, SBE, Larson, M-Tech, Hustler and many other fine ham radio brands.

See the fabulous ITC Multi 2000 2 Meter Rig

Thousands of small parts for the experimenter and hobbiest in stock. . . Many hard to find items and specialized items.

CBs in stock — Robyn, SBE, Royce, Browning, Johnson, Regency, others

Business radio equipment — Sonar, Standard, Regency, Bird, Miida, Singer, Girsch, Lampkin, Sinclair, Larson, A/S, many others

Service — Most makes of two way radios, CB radios, TV cameras, video recorders, broadcast equipment, CCTV, cable TV

Winter Specials — Radar sentry police radar receiver . . . locates police radar speed traps. Sold nationally for $45 now $29.95

Norelco video tape recorder LDL-1000. One hour on 7" reel of 2400' ½" video tape. Record your favorite programs for later enjoyment. 40DB video S/N ratio. Records sound and video. All transistor. 26 pounds. Push button operation. Standard CCTV connectors added by us. Demo units checked out and working $299 no warranty

TV camera kit. All transistor, small light TV camera. Excellent picture fidelity. More than 400 lines resolution, internal sync., video or rf output. Standard C mount. Complete with 1" vidicon and lens. Easy manual all parts and nice case. Brand new full warranty. $169.95

Color video recorders from $425. Wow

Many other items in our stores. Ask about our Clegg FM27X modifications . . . super!

Video tape. High energy high quality 2400' ½" (1 hour) reel in nice box $17 each.

VIDEO and FM COMMUNICATIONS SALES and SERVICE

COMMUNICATIONS UNLIMITED

9519 MAIN STREET P.O. BOX 463
WHITMORE LAKE, MICHIGAN 48189

Store hours, noon to 6PM, Tuesday thru Saturday. (313-449-4367)

Voxpoop

A reader, who unfortunately did not give either his name or his call on his correspondence, has made the following excellent suggestions for additions to the content of 73:

A "This Happened to Me" series which could include humorous or serious stories of first contacts, unusual QSOs, weird experiences with equipment, both home brew and commercial, etc.

An updated listing of nets operating daily in the states and abroad.

An updated listing of VIP stations; amateurs famous in fields other than amateur radio as well as those considered "professional amateurs."

A simply written column covering new concepts and components.

Guest editorials by VIPs.

Anyone out there feel like taking on any of these projects? Remember, 73 pays for publishable material.

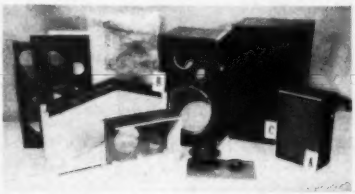
I like the magazine as is, but you won't be able to please everyone. Ha! WA6MBK. *(Boy, are you right on that one!. . .ed).* I would like to see more SSTV construction projects. The WØLMD converter article was excellent; continue along this line of quality — W7QNI. *(We will, we will. . .ed).* Keep up the off-beat articles like "Lightning in a bottle." The digital stuff is great too. Maybe an article someday on testing complex ICs such as RAMs, ROMs — Callas. You have a lot of good articles — keep sending them. Include more things a Novice can use in 73 — Tommy Richardson. Less articles on slow scan — W6NXB. *(Henry, you're sure swimming against the tide!. . .ed).* More digital please — Chris Leach. First thing read are NSD editorials. Tell OM to keep up the stomping. . .stomp on the ones who need it. . .stir up the things that need stirring up. Ham radio needs more NSDs — K7QYN. *(Troublemaker. . .ed).* More VHF-UHF projects. Regular column of hints for improving commercial equipment. More nude covers, they're great! — K8JBJ. *(Another troublemaker. . .ed).* Too much IRS and not enough ham radio — WA6UGH/3. *(Okay, you help get rid of the IRS and no one will have to write about the bastards. . .ed).* Would like to see a 2m dual synthesized IC constructed portable transceiver. . .if possible — Bill Hampton. W3HPX's Moskey is beautiful — gonna build one pronto. CMOS logic is definitely the way to build to conserve power, and prices are dropping on CMOS ICs — WA4MRE/Ø. On balance Wayne, the magazine is pretty good — you'll never be able to publish enough technical articles to suit me, but you're doing a fair job now. Keep up those editorials — W9EQG. More digital information and construction projects — when you put a project in it should be checked thoroughly to make sure all the information is given — WA1CRI. *(Oh, we try, we try. . .all articles are proofread by the authors now. . .two recent editors tried to skip that important part of the process and both are now looking for work in less exacting fields. . .ed).* You ought to include more 6m gear in the line of FM construction articles — WA6OIL/4. *(Love to. . .has anyone built anything like this recently? . . . ed)* Better yet, just double it. Two issues (one dollarette each) each month — R. Thomas. *(We've been thinking of that, but don't know how many would want it. . .ed).* How about a series on digital logic fundamentals to run for an indefinite period? This could be helpful to many hams so they can make use of contemporary construction articles — W1MKF. *(Fine idea. . . any takers?. . .ed).* I am disappointed that you do not give details about contests in 73 — C. Junck. *(We've been looking all over for a good contest editor, but haven't come up with anyone interested yet. . .pity. . . ed).* More 6m FM articles please — WB8QKR. *(Hey, is anyone on 6 these days?. . .ed).* Please — more construction projects and circuits on ATV (fast scan) — K3VUD. *(We're trying to get as much info into print as we can. . .any more articles available out there?. . .ed).* Congratulations — keep the construction projects coming — XE2OZ. Include a regular column on antennas and one on a critical review of new equipment — WN2VMG. How about something on the care and feeding of FEDs? — DA4AU. *(Like ground glass or cyanide?. . .ed).*

Like "Solid State" news approach as done by K8DIZ — W8ANJ. I feel you should be more consistent with your covers. Although I do like Schlitz, the December 73 cover was much more thrilling. Also, the more solid state the better — WB4ZXQ. I think you have a nice mix of articles and projects — WA7JLL/5. *The* best ham magazine on the market today. Pricewise also. Have been asked by many where I get some of my information and I tell them "in 73 Magazine." I give them a subscription blank if it doesn't ruin an article in the magazine. I don't like to get magazines with inserts every 16 pages. I still have all copies of 73 back to '65 — they'll make good reading in my old age — WAØWJK. *(I don't like those cards either, but they sure pay for a lot more pages in a magazine, if you happen to like a fat magazine. . . Wayne)* Would like to see more articles on counters, computers. The ICs become obsolete before articles reach print. I'm still trying to keep up with the 7400 series, which is impossible. Keep up the good work — W4GXS. Fire Wayne Green. He is a loud mouthed jerk who writes first and researches later on — WA6SLN. *(tsk, tsk. . .Wayne)* Vote for K8DIZ Solid State, and push for CW on HF for Techs — WA7DTJ. *(I have a petition with the FCC for just that — been there for years. . .Wayne)* For some reason you seem to have forgotten the six meter band — Russell, Ohio. *(While not much is doing on 6m of real news, you may have missed the 50 MHz column? Any readers want to push 6m? Be our guest. . .Wayne)* Use larger type, esp for repeater update. Cut space used by Green to one page. See Jim Fisk page — WA3VYS. *(Buy some glasses like I did and you'll read the print fine. If I had as little to say as Fisk I'd use no space at all. Oh, Fisk knows there are things he should write about, but I doubt if his publisher will let him — terror of being controversial. . .Wayne)* The editorials should be much longer — W7IDF. *(For fifteen years Ken has been an unflagging source of erudite and puckishly good humored letters, cards and articles — what a delight a reader like Ken Cole is to an editor with a mailbox full of gripes about ARRL sluggishness, DXCC rules, FCC insensitivity, subscriptions gone awry, and the other trivia which adds up to much of the usual day's work. Bless Ken and the few others like him who spread happiness. . .Wayne)* I would like more articles on building receivers for HF through 2m FM, plus test equipment such as an impedance meter — W5SQJ. *(Excellent, any takers? We'll print 'em . .Wayne)* I like Circuits[3] and IC articles, especially CMOS — W6KKD. How about 6m SSB news? Maybe repeater news by call area? — WB4MXC. More 6m equipment, SSB xmtrs rcvrs, converters, linears, etc. Also would like to see construction articles monitor scopes for SSB, CW and RTTY. Let's get more 6m articles so we don't lose that band — WA4AGD. *(We agree. . . Wayne)* How about special columns for antennas, QRP, and perhaps articles on the fundamentals of RTTY and SSTV? — W8OUG. *(We've books out on the RTTY and SSTV fundamentals, plus thorough coverage in the past. Any interest in a monthly QRP report?. . .Wayne)* I think we are all with you re IRS rip-off. Bureaucratic power fears speech, so you must be made QRT. Look at any of the leaders of "The Movement." Good luck — W2RI. *(Thanks, Al, there is much in what you say . . . Wayne).*

1975 CATALOG

Since Verada 214 expanded its mail order division with the publication of its 1975 catalog in the January issue of 73 Magazine, our family of satisfied customers has grown tremendously. Below, you will find additional products, most of which are made in our own shop. Add this page to the previous seven and look for more pages in future issues of "73." Thank you from Verada 214.

VERADA 214 CABINET KITS



All cabinets are cut from walnut-grained, vinyl-covered particle board. The two larger ones are built from extra heavy stock to reduce resonance and give clear, low bass response at high listening levels. These two larger cabinets are sealed acoustic suspension units with removable grille cloth panels. All kits include fiberglass acoustic insulator and complete assembly instructions. Speakers and grille cloth to complete these cabinets are available from Verada 214 and their prices are listed separately in this catalog.

A) BOOKSHELF CABINET KIT. Dimensions – 9-1/2"W x 14-1/2"H x 5-3/4"D. Stock sizes – Sides, 3/8" thick. Front & back, masonite. Order #CKBS (with blank front panel). Order #CK62 (cut out for 6" woofer and 3" tweeter. Price $6.75 each (CKBS or CK62).

B) BASIC ACOUSTIC SUSPENSION ENCLOSURE KIT. Dimensions – 12-3/4"W x 23-5/8"H x 11-7/8"D. Stock sizes – 3/4" thick front, back and sides. Order #CKBE (with blank front panel). Order #CK1053 (front cut out to accommodate our "Good Listening" system on page 3. (10" woofer, 5" midrange, and 3" tweeter) Price – #CKBE or CK1053 $19.50 each.

C) DELUXE ACOUSTIC SUSPENSION ENCLOSURE KIT. Dimensions – 15-1/2"W x 25-1/2"H x 11-1/2"D. Stock sizes – 3/4" thick front, back and sides. Order #CKDE (with blank front panel). Order #CKHP (front cut out to accommodate our "High Power" system on page 3. (10" woofer, two 5" midrange, 3" tweeter.) #CKHP also includes materials for sealed acoustic chamber for midrange speakers. Price – #CKDE $24.50; #CKHP $28.50.

GRILLE CLOTH

Many of you have requested smaller pieces of grille cloth, so here we offer two standard sizes. Because of the wide range of colors and patterns in stock, including beautiful tapestries, as well as standard black and brown, we offer a set of samples for $1.00, from which you can make your choice. Remember, the $1.00 can be deducted from any future order, or is refundable when the sample packet is returned.

Standard sizes: 18" x 30" – $1.50
24" x 36" – $3.00

36" x 60" or wider, $6.00/lineal yard. Multiple yard orders shipped in one piece. Choose from: Black #GCBK – Silver #GCSR – Dark Brown #GCDB – Light Brown #GCLB or order sample kit #GCSK – $1.00 (refundable)

SPEAKER WIRE

The world's only truly multi-colored cable, #24 mini-zip speaker twinlead that changes color every five feet. We don't know why they made it and we're not sure they do either. Good quality wire under the strange coloring.

50 ft. roll – #50RW – $1.00
100 ft. roll – #100RW – $1.75

Standard #24 mini-zip speaker wire with clear insulation. 50 ft. roll – #50CW – $1.50
100 ft. roll – #100CW – $2.50

Minimum Order – $2.00
On orders of $25.00 or more we ship FREE

Important – Personal checks must be cleared before merchandise is sent and only delay orders. All cash and COD orders are handled within 48 hours. Other correspondence should be written on a separate piece of paper.

COMING, IN THE MARCH ISSUE OF 73, A FULL PAGE OF SEMICONDUCTORS. BE SURE TO LOOK FOR IT!!!

Mail – **P.O. Box 438 Lowell MA 01852**
Mail Order Phone – **617-458-3077**

TTL

7400*	6/$1.00	7488	4.00
7401	.23	7489*	2.75
7402	.23	7490*	.75
7403	6/1.00	7491*	1.00
7404*	.25	7492	.95
7405	.24	7493	.95
7406	.50	7494	.97
7407	.50	7495	.95
7408	.25	7496	.95
7409	.25	74100	1.50
7410*	6/1.00	74107	.47
7411	.30	74121	.55
7412	.40	74122	.47
7413	.89	74123	1.05
7416	.45	74125	.60
7417	.45	74126	.80
7418	.25	74141	1.15
7420	.23	74145	1.15
7421	.27	74150	.95
7423	.32	75151	1.20
7425	.27	74153	1.50
7426	.31	74154	1.25
7427	.32	74155	1.30
7429	.40	74156	1.30
7430	.33	74157	1.55
7432	.26	74160	1.65
7437	.45	74161	1.65
7438	.50	74163	2.50
7439	.50	74164	2.50
7440	.23	74165	2.50
7441	1.10	74166	1.75
7442	1.05	74170	3.00
7443	1.10	74173	1.75
7444	1.15	74174	1.85
7445	1.10	74175	1.85
7446	1.25	74176	.85
7447*	1.00	74177	.85
7448	1.25	74180*	1.00
7450	.25	74181	3.75
7451	.27	74182	1.00
7453	.27	74184	2.30
7454	.40	74185	2.30
7459	.25	74187	7.00
7460	.25	74190	1.50
7470	.45	74191	1.50
7472	.41	74192*	1.25
7473	.47	74193*	1.25
7474	.47	74194	1.50
7475	.90	74195	1.05
7476	.47	74196	1.25
7480	.50	74197	1.05
7482	1.75	74198	2.25
7483	1.15	74199	2.75
7485*	1.10	74200	7.00
7486	.47		

20% Discount for 100 Pieces Combined 7400

CMOS

CD4001	$ .55
CD4002	.55
CD4007	1.25
CD4009	1.40
CD4010	.60
CD4011	.55
CD4012	.55
CD4013	1.50
CD4016	1.40
CD4017	2.75
CD4019	1.25
CD4020	1.50
CD4022	2.50
CD4023	.55
CD4025	.55
CD4027	1.25
CD4030	.60
CD4035	2.75
CD4049	1.25
CD4050	1.25

(Zener) *DIODES (Rectifier)

IN746	4/$1
IN752	4/$1
IN5232	.28c
IN5234	.28c
IN4734	28c
IN4735	28c
IN3600	6/$1
IN4148	15/$1
IN4154	12/$1
IN456	6/$1
IN458	6/$1
IN485A	5/$1
IN4001	.09
IN4002	.10
IN4004	.10
IN1183	1.60
IN1184	1.70
IN1186	1.80

✱ FEBRUARY — $PECIAL$

Miniature Aluminum Electrolytic Capacitors

— AXIAL LEAD TYPE —

— RADIAL LEAD TYPE —

MFD—VOLTS	1-9	10-99	100	MFD—VOLTS	1-9	10-99	100
1 UFD/50V	14c	12c	11c	100 UFD/16V	19c	15c	14c
2.2 UFD/50V	14c	12c	11c	100 UFD/25V	24c	18c	17c
3.3 UFD/25V	14c	12c	11c	220 UFD/16V	24c	18c	17c
4.7 UFD/25V	14c	12c	11c	220 UFD/25V	35c	25c	24c
10 UFD/16V	14c	12c	11c	330 UFD/16V	35c	25c	24c
10 UFD/25V	14c	12c	11c	330 UFD/25V	44c	35c	32c
22 UFD/16V	14c	12c	11c	470 UFD/16V	37c	30c	27c
22 UFD/25V	15c	13c	12c	470 UFD/25V	49c	39c	35c
33 UFD/16V	15c	12c	11c	1000 UFD/16V	49c	39c	35c
33 UFD/25V	17c	13c	12c	1000 UFD/25V	75c	60c	55c
47 UFD/16V	17c	14c	13c	2200 UFD/16V	75c	60c	55c
47 UFD/25V	19c	15c	14c				

*50 VOLT CERAMIC DISC CAPACITORS

.001	mf.	5c	3.5c	3c	.033	mf.	6c	4c	3.5c
.0047	mf.	6c	4c	3.5c	.047	mf.	6c	4c	3.5c
.01	mf.	5c	3.5c	3c	.1	mf.	12c		7.5c
.022	mf.	6c	4c	3.5c					

MPS-A05	5/$1	*TRANSISTORS		2N3905	4/$1
2N918	.25	2N2906A	4/$1	2N3906	4/$1
2N2219A	3/$1	2N2907A	5/$1	PN4249	4/$1
2N2221A	4/$1	2N3053	2/$1	PN4250	4/$1
2N2222A	5/$1	2N3724A	2/$1	2N4409	5/$1
2N2369	5/$1	2N3725A	2/$1	2N5129	.19
2N2369A	4/$1	2N3903	5/$1	2N5139	.19
2N2484	4/$1	2N3904	4/$1	C106B1-SCR-2	2/$1

CALCULATOR & CLOCK CHIPS w/data

5001 LSI 40 pin DIP 4 funct	$3.95
5005 LSI 28 pin DIP 4 funct w/mem	7.95
MM5311 28 pin BCD 6 dig mux	7.95
MM5312 24 pin 1 pps BCD 4 dig mux	6.95
MM5313 28 pin 1 pps BCD 6 dig mux	7.95
MM5314 24 pin 6 dig mux	7.95
MM5316 40 pin alarm 6 dig	7.95

Satisfaction Guaranteed. All Items 100% Tested
$5.00 Min. Order — 1st Class Mail — No Charge
California Residents — Add 6% Sales Tax
Wholesale Outlets — Write for Special Discounts
Write for FREE 1975 Catalog — Data Sheets .25¢ each

JAMES

P.O. BOX 822, BELMONT, CA. 94002

PHONE ORDERS — (415) 592-8097

LINEAR

LM300		$ .79
LM301H/N*		3/1.00
LM302H	Voltage Follower	.79
LM304H	Negative Volt Reg	.89
LM305H	Positive Volt Reg	1.00
LM307H/N	Op Amp (Super 741)	.35
LM308H/N	Micro Power Op Amp	1.15
LM309K*	5 Volt Regulator/Amp	1.25
LM310H	Imprd Volt Follower	1.19
LM311H/N	Hi-perform Volt Comp.	1.00
LM318N	Hi-Speed Op Amp	2.00
LM320K	-5V 5.2V 12V 15V-24 Neg. Reg.	1.75
LM324N	Quad 741 Op Amp	1.90
LM339N	Quad Comparator	2.35
LM340K	+5V 12V 15V 24V Pos. Reg.	1.89
LM340T	+5V 12V 15V 24V Pos. Reg.	1.75
LM370N	A 6 C - Squelch Amp	1.15
LM373N	AM/FM $$ 8 Strip	3.15
LM380N*	2 Watt Audio Power Amp	1.25
LM380-8N*	.6 Watt Audio Amp	1.00
NE531T	OP Amp	3.00
NE550N	Volt. Reg.	.79
LM555V*	Timer	.75
NE565H*	Phase Lock Loop (TO5)	1.75
LM565N*	Phase Lock Loop (DIL)	2.00
LM566CN*	Function Generator	2.00
LM567H*	Tone Generator (T05)	1.75
LM567CN	Tone Generator (MINI)	2.00
LM703H	RF/IF Amp	.45
LM723H/N*	Voltage Regulator	.55
LM741H/N*	Comp. Op Amp	3/1.00
LM747H/N	Dual Compen. Op Amp	.90
LM1310P	Stereo Demodulator	4.10
LM1458N	Dual Comp. Op Amp	.65
LM1556N*	5 Times Faster 741	1.85
LM2307P	Current Controlled	3.15
LM3065N	T.V.-FM Sound System	.75
LM3900N*	Quad Amp	.50
LM3905N*	Precision Timer	.65

PROJECTS		LEDS		8000 Series	
8263	$ 7.00	MV 10	5/1	8090-98	.55
8267	4.00	MV 50	6/1	8123	1.50
2513*	11.00	MV 5024	5/1	8223	4.00
2518	7.00	MAN-1	1.95	8263	7.00
2519	4.00	MAN-3	.95	8267	4.00
2524*	5.00	MAN-4	1.95	8280	.75
2525	7.00	MAN-7	1.50	8281	.85
2529*	4.00	DL 33	1.95	8288	1.15
4024P	3.00	DL747	2.50	8880	1.35

IF YOU CAN SOLDER, YOU CAN BUILD YOUR OWN

Clock/Calendar

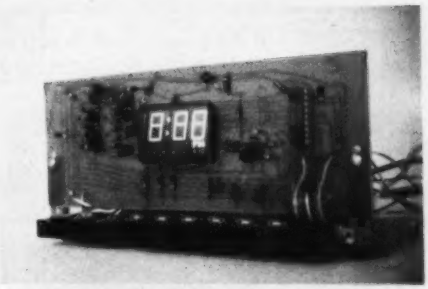
SOLID STATE SYSTEMS, INC. has available a CLOCK/CALENDAR kit containing over 120 separate electrical components.

The clear, simplified instructions include step by step construction procedures and ample illustrations which will quickly take you through construction of this versatile Clock/Calendar.

THE KIT FEATURES:

* **DISPLAY OF DATE WITH MONTH AND DAY** - displays month and day automatically, through year, except for February 29.
* **DISPLAY OF TIME ON 12 HOUR CYCLE** - hours and minutes displayed with A.M. and P.M. indicators.
* **A 24 HOUR ALARM OPTION** - this also includes a snooze button which delays alarm an additional 10 minutes.
* **A 9 HOUR 59 MINUTE TIMING OPTION** - this allows operation of any pluggable 600 watt, 120 volt, 5 amp, 60 Hz electrical device such as a radio, room light, stereo or coffee pot.
* **EASILY VISIBLE SPERRY® DISPLAY** - this display is highly visible in a well lighted room.

An attractive case may be fabricated of wood, plexiglas, metal or whatever you feel would make an appropriate show-case for your finished kit.



PLEASE NOTE: These kits do not include cases.

This kit when completed is a sophisticated device which offers many additional features due to its flexibility, here are two examples of what can be done with this device:

1. You may set the timer to play your radio for 15 minutes at bedtime, then the alarm allows you the option of waking up to the radio in the morning all automatically.
2. You may set the alarm to later start an appliance which will operate for the duration of the setting on the timer.

TO ORDER:

Order Number **01-12241 - BASIC CLOCK** - This kit does not include the 24 hour alarm option or the 9 hour 59 minute appliance timer option. Price ..... $49.95.

Order Number **02-12241 - COMPLETE CLOCK** - This kit includes all available options. Price ..... $65.00.

SOLID STATE SYSTEMS, INC.

SEND YOUR ORDERS TO:
SOLID STATE SYTEMS, INC.
P. O. BOX 617
COLUMBIA, MISSOURI 65201

OR PHONE (TOLL FREE)
800-325-2981 – 800-325-2983

the First MITS-PLUS SURPLUS SALE

MITS has always been noted for the quality parts used in its calculators, test equipment, and computer terminals. Now, for the first time ever, MITS is opening its stockroom doors to offer you all new, quality American-made electronic parts at wholesale and near wholesale prices. Resistors. Integrated Circuits including calculator chips. Transistors. Electrolytic and ceramic capacitors. 10AAR displays. LED's. PC boards. Assembly manuals. Key boards. Transformers.

Just fill out the coupon below and we will send you a free, complete parts and price list. Don't miss out on this one-time, post Christmas bargain.

TESTING!

COMPARE and SAVE!
SG 1900 full assembled, **still** $149.95
OR if you really want to save, buy the SG 1900 in kit form, with easy-to-follow assembly manual for **just** $119.95

SG 1900 — The Audio Sweep Generator provides the capabilities of both a fixed frequency (CW) and a sweep generator in a laboratory quality instrument. Modes include CW, linear sweep, and log sweep with a sweep time of 10 milliseconds to 100 seconds. Waveforms are sine, square, and triangle. The range is from 1 Hz to 100 KHz. The output has fixed attenuation levels of 0, 20, and 40 dB ±1 dB, as well as continuously variable attenuation.

MITS INC
"Creative Electronics"

Prices, specifications and delivery subject to change without notice.

☐ Enclosed is a Check of $_____
or ☐ BankAmericard # _____
or ☐ Master Charge # _____
Credit Card Expiration Date _____
Include **$5.00** for Postage and Handling
☐ **SG 1900** ☐ Kit ☐ Assembled ☐ Parts List
☐ **Please send information on Entire MITS Line.**
NAME _____
ADDRESS _____
CITY _____
STATE & ZIP _____
MITS/6328 Linn, N.E., Albuquerque, New Mexico 87108 505/265-7553

732-75

7-Segment Readout 12-PIN DIP

Three digits with right-hand decimal
Plugs into DIP sockets
Similar to (LITRONIX) DL337
Magnified digit approximately .1"
Cathode for each digit
Segments are parallel for multiple operation
5-10 MA per segment
EACH $3.00 4 (12 Digits) $11.00

RCA Numitron

EACH.....$ 5.00

SPECIAL: 5 FOR $20.00

DR2010

Potter & Brumfield

TYPE KHP RELAY
4 PDT 3A CONTACTS

24 VDC (650 coil)....$1.50

120 VAC (10.5 MA coil)....$1.75

Power Supply SPECIAL!

723 DIP variable regulator chip 1-40V, + or - output @ 150 MA 10A with external pass transistor--with diagrams for many applications.
EACH $1.00 10 FOR $8.95

SPECIAL

Special 741 fully-compensated operational amplifiers. 14-Pin DIP (only). Unmarked, tested, guaranteed. Super Special!
EACH $.35 10 FOR $3.00

5001 Calculator

40-Pin calculator chip will add, subtract, multiply, and divide. 12-digit display and calculate. Chain calculations. True credit balance sign output. Automatic over-flow indication. Fixed decimal point at 1, 2, 3, or 4. Leading zero suppression. Complete data supplied with chip.

CHIP AND DATA.....ONLY $6.95
DATA ONLY (Refundable)... $1.00
5002 LOW POWER CHIP AND DATA $12.95

High Quality PCB Mounting IC Sockets

8-PIN, 14-Pin, 16-Pin and 24-Pin PCB mounting ONLY--no wire wrap sockets.

8-Pin.....$ .22
14-Pin.....$ .26
16-Pin.....$ .30
24-Pin.....$ .75
40-Pin.....$1.25

All IC's are new and fully-tested. Leads are plated with gold or solder. Orders for $5 or more will be shipped prepaid. Add 55¢ for handling and postage for smaller orders; residents of California add sales tax. IC orders are shipped within 2 workdays--kits are shipped within 10 days of receipt of order. $10 minimum on C.O.D.'s (phone in). (916) 334-2161

MAIL ORDERS:

P. O. Box 41727, Sacramento, CA 95841
4811 Myrtle Ave., Sacramento, CA 95841

MONEY BACK GUARANTEE ON ALL GOODS!

SEND FOR FREE FLYER LISTING 100's OF MONEY-SAVING BARGAINS!

CTμL SPECIAL

Complementary Transistor Logic.
This logic family is unique in that both NPN and PNP transistors are combined in the same package. Unlike TTL & DTL, the outputs are current sources (in the high state) as well as sinking current in the low state. These are brand new units, some of which are mismarked with DTL numbers.

CTL 9956 dual 2-input AND buffer
CTL 9953 2-2-3-input AND/OR gate
CTL 9952 dual 2-input NOR gate

Data supplied; all parts are dual-in-line. MIX OR MATCH. 5 FOR $1.00

LED's

MV50 Red Emitting 10-4 MA @ 2V — $ .20 10 FOR $1.25

MV5024 Red TO-18 High Dome — $ .35 10 FOR $2.95

MV108 Visible Red 5-7 MA @ 2V — $ .30 10 FOR $2.50

CMOS

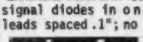
CD4001	$ .75	CD4023	$ .75
CD4002	.75	74C20	.75
CD4011	.75	74C160	3.25
CD4012	.75		

3-Amp Power Silicon Rectifiers

MARKED EPOXY AXIAL PACKAGE

PRV	PRICE	PRV	PRICE
100	$.10	800	$.30
200	.15	1000	.40
400	.18	1200	.50
600	.23	1500	.65

DIODE ARRAY 10-1N914 silicon signal diodes in one package. 20 leads spaced .1"; no common connections.



EACH.....$.29
10 FOR $2.50

BABYLON ELECTRONICS

7400	$ .25	74H51	$ .35
74H00	.35	7453	.20
7401	.20	7454	.25
74H01	.35	74L54	.35
7402	.35	74L55	.35
7404	.28	7460	.20
74H04	.35	74L71	.30
7405	.28	7472	.40
7406	.70	74L72	.50
7408	.35	7473	.60
74H08	.35	74L73	.75
7410	.25	7474	.65
7413	1.25	74H74	.80
7417	.40	7475	1.40
7420	.25	7476	.60
74L20	.35	74L78	.80
74H20	.35	7480	.65
74H22	.35	7483	1.00
7430	.25	7489	4.00
74H30	.35	7490	1.20
74L30	.40	7492	.90
7440	.25	7493	1.15
74H40	.35	7495	1.15
7441	1.25	74L95	2.00
7442	1.20	74107	.70
7447	1.50	74145	1.20
7450	.25	74180	1.25
74H50	.35	74193	1.50
7451	.25	74195	1.00
74L51	.30		

7400 Series DIP

25K Trimmer

PRINTED CIRCUIT BOARD TYPE
EACH $.20 10 FOR $1.50

Rectifiers

VARO FULL-WAVE BRIDGES

V5447	2A	400V	$ .90
V5647	2A	600V	$1.10

MR810 Rectifier 50V 1A $ .10

Special 811: Hex Inverter

TTL DIP Hex Inverter; pin interchangeable with SN 7404. Parts are brand new and branded Signetics and marked "811."

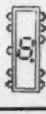
EACH.....$ .30
DATA SHEET SUPPLIED 10 FOR..... 2.50
100 FOR.... 23.00
1000 FOR...$20.00

MAN 3

0-9 plus letters. Right-hand decimal point. Flat-pack type case. Long operating life. IC voltage requirements. Ideal for pocket calculators!

EACH $1.25
10 OR MORE $1.00 EA

MAN 4



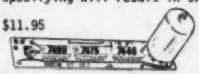
7-Segment, 0-9 plus letters. Right-hand decimal point. Snaps in 14-pin DIP socket or Molex. IC voltage requirements. Ideal for desk or pocket calculators!

EACH $2.75 10 OR MORE $2.50 EACH

CD-2 Counter Kit

This kit provides a highly sophisticated display section module for clocks, counters, or other numerical display needs. The unit is .8" wide and 4 3/8" long. A single 5-volt power source powers both the ICs and the display tube. It can attain typical count rates of up to 30 MHz and also has a lamp test, causing all 7 segments to light. Kit includes a 2-sided (with plated thru holes) fiberglass printed circuit board, a 7490, a 7475, a 7447, a DR2010 RCA Numitron display tube, complete instructions, and enough MOLEX pins for the ICs... NOTE: boards can be supplied in a single panel of up to 10 digits (with all interconnects); therefore, when ordering, please specify whether you want them in single panels or in one multiple digit board. Not specifying will result in shipping delay.

COMPLETE KIT ONLY $11.95
FULLY-ASSEMBLED UNIT $15.00



Boards supplied separately @ $2.50 per digit.

L I N E A R S

NE540	70-Watt power driver amp	$2.00
NE555	Precision timer	1.50
NE560	Phase lock loop DIP	3.25
NE561	Phase lock loop DIP	3.25
NE565	Phase lock loop TO-5	3.25
NE566	Function generator TO-5	4.00
NE567	Tone decoder TO-5	3.00
709	Popular Op Amp DIP	.45
710	Voltage comparator DIP	.75
711	Dual comparator DIP	.40
723	Precision voltage regulator DIP	1.00
741	Op amp TO-5/MINI DIP	.55
747	Dual 741 op amp DIP	1.50
748	Op Amp TO-5	1.00
CA3018	2 Isolated transistors and a Darlington-connected transistor pair	1.00
CA3026	Dual differential amp	1.00
CA3045	5 NPN transistor array	1.00
LM100	Positive DC regulator TO-5	1.00
LM105	Voltage regulator	1.25
LM302	Op Amp voltage follower TO-5	1.25
LM308	Op Amp TO-5	1.00
LM309H	5V 200 MA power supply TO-5	1.00
LM309K	5V 1A power supply module TO-3	2.00
LM311	Comparator TO-5	1.75
LM370	AGC amplifier	2.00
LM380	2-Watt Audio Amp	1.75
LM1595	4-Quadrant multiplier	2.00
MC1536T	Op Amp	2.00

CHARGE IT ON

master charge
THE INTERBANK CARD

CHARGE IT ON

BANKAMERICARD

DIAL-A-DEAL HAM RADIO CENTER

TOLL FREE NUMBER
(Continental 48 States)
800
325-3636
MO CUSTOMERS CALL
314-993-6060
COLLECT

CALL FREE

CALL FREE

TRADE ON NEW

TRADE ON USED

CALL

HAM RADIO CENTER

(9 A.M. – 5 P.M. Central, Closed Sunday and Monday)

FOR A SQUARE DEAL ON

- DRAKE
- TEMPO/ONE
- TEN/TEC
- CLEGG
- STANDARD
- YAESU
- SWAN
- COLLINS
- KENWOOD
- REGENCY

We carry all major brands and a large stock of used reconditioned equipment

HAM RADIO CENTER INC.
8342 OLIVE BL.
P.O. BOX 28271 ST. LOUIS MO 63132

RGS ELECTRONICS

008A MICROCOMPUTER KIT
8008 CPU, 1024 x 8 memory; memory is expandable. Kit includes manual with schematic, programming instructions and suggestions; all ICs and parts supplied except cabinet, fuses & hardware. Includes p.c. board. $375.00
MANUAL ONLY, $25.00

008A-K ASCII KEYBOARD INPUT KIT
Includes keys, p.c. board, all ICs, power supply, instructions, schematic. Intended to interface ONLY with the RGS Electronics 008A Microcomputer. $50.00

"THE CUBE" Fully assembled subaudible tone generator for small handheld or portable FM radios. 9-16 volts; no moving parts; set anywhere between 98 & 240 Hz with a trim resistor.
.5" x .6" x .7" $19.95
Set on frequency by the factory, $5.00 extra

PS 5–1 5v 1a regulated power supply kit with p.c. board & instructions. Board measures 2" x 5", completed kit is 2" high. Transformer has internal r.f. shield. $8.00

PS 25–1 0 to 25v 1a lab type power supply with adjustable current limiting; remote sensing & remote programming for voltage & current. Instructions included. All parts except chassis, meter(s), p.c. board.
Kit of parts with schematics $14.95
P.C. boards available, No. 007 $3.00 ea
We have brand new 8038 function generators $5.25 ea

TTL

7400	$ .20	7485	$1.40
7401	.20	7486	.50
7402	.20	7489	2.90
7403	.20	7490	.80
7404	.25	7492	.80
7405	.25	7493	.80
7406	.45	7495	.90
7407	.45	7496	.85
7408	.25	74107	.50
7409	.25	74121	.60
7410	.20	74122	.60
7411	.30	74123	1.10
7413	.85	74125	.65
7416	.45	74126	.65
7417	.45	74141	1.25
7420	.20	74150	1.70
7430	.20	74151	1.00
7432	.30	74153	1.40
7437	.50	74154	1.70
7438	.50	74157	1.40
7440	.20	74161	1.50
7442	1.10	74163	1.70
7446	1.45	74164	2.00
7447	1.45	74165	2.00
7448	1.45	74166	1.75
7450	.20	74174	2.20
7451	.20	74175	2.20
7453	.20	74176	1.60
7454	.20	74177	1.35
7473	.45	74181	3.90
7474	.45	74192	1.50
7475	.80	74193	1.45
7476	.50	74195	1.00
7483	1.10	74200	8.00

BRAND NEW ALUM. ELECTROLYTIC CAPS, RADIAL LEAD

	10wv	35wv	50wv
1mfd	$ .10	$ .12	$ .15
2mfd	.10	.12	
5mfd	.10	.12	
10mfd	.11	.13	.16
30mfd	.12	.20	.28
50mfd	.13		
100mfd	.15	.30	.45
200mfd	.20		.70
500mfd	.28	.75	
1000mfd	.50		

TRANSISTORS	1–9	10+
2N2222 (NPN) TO–18	$ .25	$ .20
2N2907 (PNP) TO–18	.25	.20
TO–92 general purpose NPN & PNP transistors, beta > 100, breakdown > 40v	$ .08 each	$5.95/100

JUNCTION FETs, TO–18

N–CHANNEL:	**SIMILAR TO:**	
NJF10	2N4416, MPF102	3/$1.00
NJF11	2N4091–93	4/$1.00
NJF12	2N4338–41	4/$1.00
NJF13	2N3089	3/$1.00
NJF14	2N4221–22	4/$1.00
P–CHANNEL		
PJF11	2N3382–86	4/$1.00
PJF14	2N2608	4/$1.00

All FETs come with data sheets.

RGS ELECTRONICS

3650 Charles St., Suite K ■ Santa Clara, CA 95050 ■ (408 247–0158)

We sell many ICs and components not listed in this ad. Send a stamp for our free flyer. TERMS OF SALE: All orders prepaid; we pay postage. $1.00 handling charge on orders under $10.00. California residents please include sales tax. Please include name, address and zip code on all orders and flyer requests. Prices subject to change without notice.

DISCOUNTS: 10% OFF ORDERS OVER $25.00; 20% OFF ORDERS OVER $250.00.

GODBOUT

BILL GODBOUT ELECTRONICS
BOX 2673, OAKLAND AIRPORT, CA 94614

CLOSE-OUT! DIGITAL CLOCK KIT $23.73

Full Six Digit LED Display – 12/24 HR – 50/60 Hz operation! Handsome anodized aluminum case approximately 2" x 5" x 1½". All components, PC board, with instructions for easy assembly.

8008 Computer Special includes: 1 – 8008 8 bit CPU, 8 – G2102/2602 1 X 1024 NMOS status RAMs, 1 – G5203 8 X 256 bit MOS EROM $130.00

READOUT RIOT

DL 704	.3"	Common Cathode	$1.25	4/3.95
DL707	.3"	Common Anode	1.50	4/4.95
MAN 1	.27"	Common Anode	1.95	4/7.50
MAN 74	.27"	Red Common Cathode	1.50	4/5.25
MAN 401	.27"	Red Common Anode	1.50	4/5.25
MAN 84	.27"	Yellow Common Cathode	1.95	4/7.50
DL 33-1	.1"	Red 2 digit w/minus in DIP	1.00	
OR 33	.1"	Red 3 digit in DIP	1.75	
MV 1050	min 1	Discrete LED (bottom leads)		10/1.00
MV 50	min 1	Discrete LED (side leads)		10/1.00

EXPERIMENTER'S SPECIALS

Over 500 1/4W resistors with leads cut and formed for PC insertion, good mix of values 3.95
Mini reed relays SPST n.o. Form A contacts 3000 ohm coil 8-15V 2/1.00
6 assorted photo resistors 6/1.95
10 assorted thermistors 10/1.95
20 key calculator keyboard w/on-off switch mounted in mini calculator case (no bottoms), print supplied 1.95
PC mount inductors – no mystery values – 1 to 680 microhenries 20/1.95
Microswitch keyboard – type 53RW4-1 – 53 key full alphanumeric brand new factory pack 19.95
8038 Function generator square-triangle-sine 4.50

ALL ITEMS IN STOCK and will be shipped within 24 working hours of receipt of order!

Include 50¢ postage and handling on orders under $10.00

Sorry, NO C.O.D. s. CALIFORNIA RESIDENTS ADD sales tax.

RC OSCILLATORS

16 pin IC chip contains 4 RC osc. Ideal for touch tone encoder. TCA 430. $5.00

COLUMBIA 4 CHANNEL SQ

Solid state SQ 4 channel adapter, 2 amps built in. Decodes 4 channel or synthesizes 4 channel. $35.00

8 CHAN MULTIPLEX SWITCH

Solid state 16 pin IC MOS. 8 channel w/output enable control & one-of-eight decoder in chip. With data. Fairchild 3705. $5.00

LED READOUTS 5/$1.00!

The price is not a mistake. We have some hobby variety with some segments out. Ukinbuyem for as low as 5 for $1.00

LOGIC SUPPLY

New, made by Computer Products, Fla. High voltage 170V and 5V logic output. Solid state, highly regulated & filtered. PM 728. $20.00

DUAL 16 BIT MEMORY

Dual 16 bit memory, serial MOS by Philco TO-5 case, brand new with 2 page specs.
PLR 532 $1.00 each $10/12

MEMORY SYSTEM $125.00

1024 core memory system. 1024 words memory, 8, 9 or 10 bits/word. Random access with all logic, register, timing, control, core select and sense functions in one package. New, with 60 page booklet includes schematics. Measures only 9x4x1 inches. Good start for mini-computer.

AM–FM RADIO

For console installation, w/face plate, no knobs. Stereo amplifiers for tape or turnable playback. $15.00
Pair of matching speakers w/xfmrs for above $5.00

CALCULATOR CHASSIS

Fully assembled pocket calculator chassis with calculator chip. Uses LED readouts not included. $5.00

TONE GEN. BOARD

3 Octave tone gen. board from Magnus Organ. Unused and tested, with instructions & amp.
$14.95 two for $25.00

ELECTRIC SIREN $10.00

Brand new, operate 6 or 12 volts dc. Just the thing to protect car or boat. Used also as burglar or fire alarm in house & camp. Kinda scarce, but we found some. While they last
$12 each, 2/$20.00

PIANO KEYBOARD $9.95

For use with above organ or synthesizer, etc.

MULTI-USE XFMR $8.95

Output 18 V @ 6 amp; 17V @ 6 amps; 10V @ 10 amp. Brand new. $8.95 ea, 2 for $15; 10 for $50

SOLAR ENERGY

Electricity for free from the sun. An exciting experimental device. Instructions included show how to make a solar energy bank for higher voltages and/or current; also how to make a solar operated radio receiver.

Giant cell 2" diameter – $1.50
Large cell 1 3/4" – $1.25
Medium cell 1" diameter – $1.00
Rectangular 3/4 x 1½" – $.75
Any six for the price of 5

PHOTO-STROBE

Made for Instamatic but useful on any camera with instructions provided. Info also on trick uses, automotive strobe, slave strobe, automotive strobe, Psychadelic repetitive strobe, etc. Complete with charger & Nickel Cadmium batteries.
$9.95 or 3 for $25.00

BOOKSHELF SPEAKERS

Completely finished, 9" x 12" x 5 inches. 16 ohm with extension cord. $15 a pair.

Meshna *FREE catalog.* MESHNA PO Bx 62 E. Lynn Mass. 01904
Please add shipping cost on above.

MICROPROCESSORS by Poly Paks!

8008 "THE COMPUTER ON THE CHIP"

$79.95 ☐

Usually called "Microprocessor" — it is a p Channel Si gate MOS 8-bit Parallel Central Processor. A CPU Central Processing Unit on a chip. Features complete instruction decoding and control. Capability to address 16K x 8 bits of memory (RAM, ROM, SR). Build a micro-computer system when interfacing with other chips, such as 1101, 1103, 2102 (RAMS), etc. With spec sheets. 16-pin dip package. $79.95

2102 1000-bit 'static" Ram for above. $9.95

16-BIT MICRO PROCESSOR BASIC SYSTEM

☐$149.

The lowest-priced 16-bit system! Outperforms the 8008. The CPU (Central Processing Unit) includes 4-MM5750's, called RALU's, and one MM5751 CROM. RALU — called Register and Arithmetic Logic Unit — is a 4-bit control bus, and the CROM is a Control-and-Read-Only Memory. The four RALU's is parallel form a 16-bit unit. The RALU's are controlled by micro-instructions, stored in the CROM. With spec sheets.

6 & 8 DIGIT MINI CALCULATOR BASICS

- •So small fits in 'ur palm!
- •Easiest basics around!
- •Requires approx. 6 more parts.

"The key parts kits"

KIT NO. 5030 — 6 functions. Includes mini case, with lens, HP nine digit readouts with multiplex pc board, main pc board, mini keyboard (with two switches, percent and constant), ac adapter jack, 2- SN75491 drivers, CT5030 calculator chip with diagram. ☐$16.95

KIT NO. 5031 — 4 function, same as 5030 except uses CT5031 chip. ☐$16.95

KIT NO. 5736 — 4 function, like 5031. Uses National MM5736 ☐$12.95

$24.50 SIMPLEST! FINEST! SMALLEST!

6-FUNCTION AC-DC CALCULATOR KIT!

- **Lightweight, pocket size**
- **Extra large display**
- **6 functions plus, minus, times, percentage, constant**
- **Floating decimal**
- **Chain and Mix calculations**
- **True credit balance**
- **Simplified indexing**
- **Mark up and Mark down**
- **Constant multiplication and division • AC adaptor jack**

The fewest parts in a kit. Imagine the pc board only has the chip, 4 resistors, two transistors, two driver ic's with the 9 digit readout. SIMPLE! You bet it is. tor story. Kit includes: attractive black case with red filter; Flex Key (type 208K-66) 16 key keyboard that measures only 2½ x 2" with 2 switches, one for ON-OFF, one for K constant; MAIN pc board; readout board; famous Cal Tech 5030 26-pin calculator chip; two 75491 ic drivers; Hewlett Packard 9 digit array; ac jack; 9 Volt battery connector resistors; two transistors; back protective plate; necessary wire pluge; easy instructions. (Less 9 volt standard battery and AC adapter) IMAGINE! only 2½ x 1 x 4½".

'ALL LED' MONSANTO READOUTS

	MONSANTO TYPE	CHAR. HT.	SALE EACH	Quantity Discounts
☐	MAN-1	.27	$3.50	3 for $ 9.
☐	MAN-2	.33*	4.95	3 for $14.
☐	MAN-3	.12	1.00	3 for $2.50
☐	MAN-6	.60	4.50	3 for $12.
☐	MAN-64	.4	3.50	3 for $ 9.
☐	MAN-7	.27	1.50	3 for $ 3.

MAN-64 *35 LED matrix

THREE QUARTER INCH DIGITS BY OPCOA 3 for $13 $4.95

- • 0.7 character
- • 0 to 9

7 Segments 30 mils

☐	SLA-3H	RED
☐	SLA-4H*	RED
☐	SLA-13	GREEN
☐	SLA-14*	GREEN
☐	SLA-23	YELLOW
☐	SLA-24*	YELLOW

*Plus or Minus one

7-segment **OPCOA SLA-1 REFLECTIVE LED READOUT**

$2.50 ☐ Red ☐ Yellow

3 for $ 6. ☐ Green

Imagine a chip (MK50250) "Beepin" and audible alarm! All others are external. It also features internal brightness control. The CT7001 requires external triggering of alarm, date of the month and direct drive to LED readouts. Both require minimum current drain and voltages, for either 4 to 6 LED readouts. 12 or 24 hours, AM and PM.

'BEEPER" AND 'DATER' CLOCK ON THE CHIPS

☐ MK50250 BEEPER ONLY. $ 8.50

☐ CT7001 Alarm and Date. . $12.50

PRECISION CRYSTAL Only $1.95

Excellent time base and other uses. 5.000 MHz. Type H6U case.

"C" THRU S METER

$1.50

Indicatcn: 0 to 1.5 Plastic case. 1½ x 1½ x 1".

CLOCK CHIPS ON A "DIP" as Low as $4.95

WITH DATA SHEETS

☐	MM5311	6-digit 28-Pin	6.95
☐	MM5312	4-digit 24-Pin	6.95
☐	MM5313	6-digit 28-Pin	6.95
☐	MM5314	6-digit 24-Pin	6.95
☐	MM5316	4-digit 40-Pin, Alarm	8.88
☐	MM5316-A	no alarm	4.95

SCRS! TRIACS! QUADRACS! SAME PRICE SALE!

10-Amp Power Tab Plastic Units

	PRV	Sale
☐	50	$ .75
☐	100	.95
☐	200	1.25
☐	300	1.50
☐	400	1.95
☐	500	2.25
☐	600	2.50

6 DIGIT KRONOS CLOCK

Using MAN-3S

Complete KIT

$29.95 ☐

Money-Back GUARANTEE on all items

FULL WAVE EPOXY SILICON BRIDGE RECTIFIERS

	PIV	2 Amp	6 Amp	10 Amp
☐	50	$ .69	$ .88	$1.49
☐	100	.79	.99	1.69
☐	200	.95	1.25	1.89
☐	400	1.19	1.50	2.09
☐	600	1.38	1.75	
☐	800	1.59	1.95	Code: 2 amp
☐	1000	1.79	2.25	TO-5 case

6 Amp 1/2 x 1/2 x 3/16 sq.

Inflation-Fighting IC PRICES

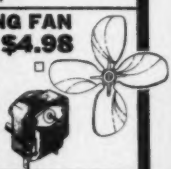
Buy 100 — Take 25%

Buy10 or more 15% discount

Order by type number! Spec sheets on request "ONLY" • Factory Marked

	Type	Sale
☐	SN7400	$ .17
☐	SN7401	.17
☐	SN7402	.17
☐	SN7403	.17
☐	SN7404	.21
☐	SN7405	.21
☐	SN7406	.37
☐	SN7408	.23
☐	SN7409	.23
☐	SN7410	.18
☐	SN7411	.37
☐	SN7413	.73
☐	SN7414	2.25
☐	SN7415	.37
☐	SN7416	.37
☐	SN7417	.37
☐	SN7420	.18
☐	SN7422	.37
☐	SN7423	.33
☐	SN7425	.37
☐	SN7426	.37
☐	SN7427	.31
☐	SN7430	.17
☐	SN7432	.37
☐	SN7437	.41
☐	SN7438	.35
☐	SN7440	.17
☐	SN7441	.95
☐	SN7442	.95
☐	SN7443	.95
☐	SN7444	1.05
☐	SN7445	1.05
☐	SN7446	1.10
☐	SN7447	1.10
☐	SN7448	1.10
☐	SN7450	.17
☐	SN7451	.23
☐	SN7453	.23
☐	SN7454	.37
☐	SN7460	.37
☐	SN7462	.37
☐	SN7464	.37
☐	SN7465	.37
☐	SN7471	.49
☐	SN7472	.33
☐	SN7473	.41
☐	SN7474	.41
☐	SN7475	.71
☐	SN7476	.45
☐	SN7478	.85
☐	SN7480	.61
☐	SN7481	1.19
☐	SN7482	.99
☐	SN7483	.99
☐	SN7486	.41
☐	SN7489	2.50
☐	SN7490	.71
☐	SN7491	1.15
☐	SN7493	.71
☐	SN7495	.85
☐	SN7496	.85
☐	SN74100	1.85
☐	SN74104	1.25
☐	SN74105	.45
☐	SN74106	.45
☐	SN74107	.45
☐	SN74108	.89
☐	SN74112	.91
☐	SN74113	.91
☐	SN74114	.89
☐	SN74121	.55
☐	SN74122	.51
☐	SN74123	.91
☐	SN74125	.65
☐	SN74126	.73
☐	SN74140	2.50
☐	SN74141	1.19
☐	SN74145	1.12
☐	SN74148	2.50
☐	SN74150	.99
☐	SN74151	.85
☐	SN74153	1.05
☐	SN74154	1.49
☐	SN74155	1.09
☐	SN74156	1.19
☐	SN74157	1.19
☐	SN74158	1.45
☐	SN74161	1.29
☐	SN74163	1.49
☐	SN74164	1.79
☐	SN74165	1.79
☐	SN74166	1.55
☐	SN74173	1.35
☐	SN74174	1.49
☐	SN74175	1.31
☐	SN74176	1.55
☐	SN74177	1.55
☐	SN74180	1.05
☐	SN74181	3.50
☐	SN74182	.79
☐	SN74190	1.49
☐	SN74191	1.49
☐	SN74192	1.49
☐	SN74193	1.29
☐	SN74195	.89
☐	SN74197	.89
☐	SN74198	2.10
☐	SN74199	2.10
☐	SN74200	4.95

GIANT VENTILATING FAN



$4.98 ☐

Heavy-duty powerful hi-torque motor, ruggedly constructed. Permanently lubricated type bearings. Thermalloy protected. Motor size: 3 x 3 x 2½". By Molon ZM04047. 115 vac 60 hz. 0.77 amps. With 6½ TORIN fan blade. 1500 rpm. For all types of ham & industrial equipment.

Terms: add postage Rated: net 30

Phone Orders: Wakefield, Mass. (617) 245-3829

Retail: 16-18 Del Carmine St., Wakefield, Mass. (off Water Street) C.O.D.'S MAY BE PHONED

☐ 20c CATALOG Fiber Optics, 'ICs', Semi's, Parts

MINIMUM ORDER — $4.00

POLY PAKS

P.O. BOX 942A LYNNFIELD, MASS. 01940

READER SERVICE

Check appropriate boxes for desired company brochures, data sheets or catalogs and mail in to 73. Include your zip code, please. Send money directly to advertisers.

LIMIT: 25 requests.

ADVERTISER INDEX

- ☐ Adirondack 137
- ☐ Adva 106
- ☐ Airwaves Elec 124
- ☐ Ancrona 92
- ☐ Aptron 44
- ☐ Arnold's Engraving 42
- ☐ ATV 137
- ☐ Audioland 61
- ☐ Babylon 153
- ☐ Cassette HQ 122
- ☐ CFP 79
- ☐ Clegg 89
- ☐ COAKIT 130
- ☐ Comm. Spec. 137
- ☐ Comm. Unltd. 147
- ☐ Control Sig. 24
- ☐ Cornell 124
- ☐ Datak '60
- ☐ Data Sig. 35, 85
- ☐ Dentron 97
- ☐ DuPage 146
- ☐ ECM 79
- ☐ Ehrhorn 105
- ☐ Egbert 42
- ☐ Emergency Beacon 25
- ☐ Erickson 144
- ☐ Freck 130
- ☐ Gateway 41
- ☐ GENAVE 83
- ☐ Glenwood Trading 110
- ☐ Godbout 156
- ☐ Ham Import Sales 63
- ☐ Ham Radio Center 154
- ☐ Henry 45
- ☐ Herbach/Rademan 124
- ☐ ICOM 127
- ☐ Int. Elec. Unltd. 142
- ☐ Int. Telecomm. 53
- ☐ James 150
- ☐ Jan 52
- ☐ K-Enterprises 98
- ☐ KLM 95
- ☐ Meshna 157
- ☐ MITS 152
- ☐ Morgain 66
- ☐ Newtronics C II
- ☐ Palomar 64
- ☐ Poly Paks 158
- ☐ Radio Am. Callbook 86
- ☐ Regency 34
- ☐ RGS 155
- ☐ Rohn 117
- ☐ Robot 57
- ☐ Sentry 9
- ☐ Slep 114
- ☐ Solid State 151
- ☐ Space Elec. 137
- ☐ Spec. Comm. 98
- ☐ Standard 30
- ☐ Star-kits 42
- ☐ Sumner 39
- ☐ Swivitech 125
- ☐ TPL 128
- ☐ Tri Tek 130
- ☐ Trumbull 124
- ☐ Tucker 67, 69, 71, 73, 75, 119
- ☐ Verada 149
- ☐ VHF Eng. C IV
- ☐ Wilson 121
- ☐ World QSL 124
- ☐ Yaesu C III

73 Stuff

Repeater Atlas 52
Novice Guide 64
Latest Releases 80
Hotline 107
Back Issues 133

Bookshop 138, 139, 140
Subs 141
QSLs 143
Code Tapes 145

☐ *NEWSSTAND* ☐ *SUBSCRIPTION*

***Reader service inquiries not solicited. Correspond directly to company.**

FEBRUARY 1975

Reader's Service
73 Inc., Peterborough NH 03458
Please Print or Type

Name_____ Call_____

Address_____

City _____ State_____ Zip_____

Coupon expires in 60 days . . . . .

PROPAGATION CHART

J.H. Nelson

Good (open) Fair (□) Poor (O)

February

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7	7	3	3	3	3	3	7	7A	14	14A
ARGENTINA	14	7B	7B	7	7	7	14	14A	14A	14A	21	21
AUSTRALIA	14	7A	7B	7B	7B	7	7	7A	14	14	14	14A
CANAL ZONE	14	7	7	7	7	7	7A	14	14A	21	21	14A
ENGLAND	7	3A	3A	3	7	7	7A	14	14A	14	7A	7
HAWAII	14	7A	7	7	7	7	3A	7	7	14	21	14A
INDIA	7	7	7B	7B	7B	7B	7B	14	7A	7B	7B	7
JAPAN	14	7B	7B	7B	7	3A	7	7	7	7B	7B	14
MEXICO	14	7	7	7	7	7	7	14	14	14A	14	14
PHILIPPINES	14	7B	7B	7B	7B	3B	7	7	7	7B	7B	7B
PUERTO RICO	7	7	7	7	3	3	7A	14	14	14	14	14
SOUTH AFRICA	7	7	7	7	7B	7B	14	14A	21	21	14A	14
U. S. S. R.	7	7	3	3	7	7	7B	14	14	7B	7B	7
WEST COAST	14	7A	7	7	7	7	7	7A	14	14A	14A	14A

CENTRAL UNITED STATES TO:

ALASKA	14	7A	7	3	3	3	3	3	7	14	14	14A
ARGENTINA	14	7A	7B	7	7	7	7	14A	14A	14A	21	21
AUSTRALIA	21	14	7B	7B	7	7	7	7	7A	7A	14	14
CANAL ZONE	14	7	7	7	7	7	7	14	14A	21	21	14A
ENGLAND	7	3A	3A	3	7	3	7	7A	14	14	7B	7
HAWAII	21	14	7	7	7	7	7	3A	7	14	21	21
INDIA	7	7	7B	7B	7B	7B	3B	7	7	7	7B	7B
JAPAN	14	14	7B	7B	3	7	3	7	7	7B	7B	14
MEXICO	14	7	7	3	7	3	3	7	14	14	14	14
PHILIPPINES	14	14	7B	7B	3B	7B	3	7	7	7	7B	7B
PUERTO RICO	14	7	7	7	7	7	7	14	14	14A	14	14
SOUTH AFRICA	7	7	7	7	7B	7B	7B	14	14A	14A	14	14
U. S. S. R.	7	3	3	3	7	7	7	7	14	7B	7B	7B

WESTERN UNITED STATES TO:

ALASKA	14	14	7	3	3	3	3	3	7	7A	14	14
ARGENTINA	21	14	7B	7B	7	7	7	7B	14	14A	21	21
AUSTRALIA	21	21	14	7B	7	7	7	3A	7	7A	14	14
CANAL ZONE	14	14	7	7	7	7	7	7A	14A	21	21	21
ENGLAND	7	7	7	3	7	7	3	7B	14	14	7B	7B
HAWAII	21	14A	14	7	7	7	7	3A	7	14	21	21
INDIA	7	14	7B	3B	3B	3B	3B	7A	7	7	7	7
JAPAN	14A	14	7B	7B	3	7	7	3	7	7	7B	14
MEXICO	14	7A	7	7	7	7	7	7	14	14	14A	14
PHILIPPINES	14A	14	7A	7B	3B	7B	7B	3	7	7	7B	14
PUERTO RICO	14	7	7	7	7	7	7	14	14A	21	21	14A
SOUTH AFRICA	14	7	7	7	7B	7B	7B	7B	14	14A	14	14
U. S. S. R.	7	3	3	3	3	3A	3	7	7A	7	7B	7B
EAST COAST	14	7A	7	7	7	7	7	7A	14	14A	14A	14A

A = Next higher frequency may be useful also.
B = Difficult circuit this period.

A = Next higher frequency may be useful also.
B = Difficult circuit this period.

GRR GRRREEN

EMP! Are You Prepared?

The answer to that is a resounding NO! EMP . . . Electromagnetic Pulse generation by the explosion of a nuclear device (also known as an atom bomb) has not been given much publicity . . . and that is unfair, because it presents some problems almost as serious as the bomb itself. Why have only one worry if you can have two, right?

Since the nuclear tests were made several years ago, back when they were using tubes . . . before the advent of solid state electronic equipment, the seriousness of the EMP problem was not realized. Tubes, as you may recall if you are over thirty, can stand an awful lot of zap on their input with no long range bad effects. Transistors go to hell immediately when zapped.

It seems that when a nuclear bomb goes off in the atmosphere a lot of gamma rays are generated and interact with the air to generate a substantial magnetic field . . . something on the order of 10,000,000 volts per meter. This magnetic field is so strong that there is probably no feasible way of shielding electronic equipment against it. It will burn out any semiconductor, confuse logic circuits and wipe out core memories. Think what that will do to telephone service to amateur radio, and broadcast radio! About the only thing left running may be an ancient Gonset Communicator here and there . . . and some old Motorola tube gear.

Heretofore we thought all we had to worry about during a nuclear attack was the initial blast, the firestorm if the blast is set off in the air, and the radioactive fallout. We figured that if we made it through the initial holocast we could set up our ham rigs and start trying to pull things together again.

It probably is not a good idea to even bring up this difficulty with civil defense officials since, with a few exceptions (probably very few), the intellectual awareness of most of them will not be able to cope with this added problem. Amateurs asking about CD plans to cope with the firestorms which air exploded nuclear bombs bring on have been given the fish eye and henceforth ignored. It does seem likely that since this type of explosion creates the greatest destruction, that this can be expected should negotiations fail during some future crisis. Most antennas and all feedlines can be expected to vaporize from the heat . . . along with a lot of us chaps.

Frankly, considering the amount of logic and transistors being used in repeaters and other ham gear, this is apt to be a bit discouraging. Perhaps George Grammar was right a few years back when he advised us to forget about transistors and stick to tubes. The thought of all that stuff going blip and turning into monodes approaches the unthinkable.

But how much energy are we talking about here? Perhaps we can button up our gear a bit and keep it secure. Energy in this case is measured in Watt-seconds . . . the quantity is the Joule, which is one Watt consumed for one second. It takes about .00001 Joule to ruin most semiconductors and a memory erasure can take as little as .000000001 Joule! Okay? Now how about a thermonuclear bomb? How many Joules are we starting with? The book says we get about 1,000,000,000,000 Joules. Now how are we going to go about keeping out that kind of zonker? If you like powers of ten, you're trying to figure out how to cut 10^{12} Joules down to less than 10^{-5} Joules . . . a factor of 10^{17}. By the time you got something shielded enough and by-passed enough to keep out that order of magnitude you'd never get anything you wanted into it to use it.

Say, come to think of it, the Russians are still using tubes for most things. Let's hope they modernize quickly . . . we'll all feel better. Are the Chinese using tubes?

If we elect someone who thinks that a war will be the best solution to a recession, let's hope he picks on some small unaligned country. Come to think of it, after failing so miserably in trying to beat North Vietnam, perhaps we'd do well to try some other solution to our economic woes . . . like cutting expenditures.

MORSE CODE TAPES?

Sure enough, an immitator has come along with code cassettes. . .it was to be expected. In this case it is not an improvement.

If you don't mind a little sarcasm, you might consider the other code cassettes if you are really into learning the code and want to take a *long* time to do it. The system of teaching used on the other cassette is right out of the 1930's and guaranteed to take you from five to ten times as long to get up to speed as the 73 code course.

What is the difference? The 73 cassettes have two main things going for them. . .firstly, in one hour the average person can master the entire alphabet, the ten numerals and the needed punctuation with the 5 WPM beginners tape. This starts right out teaching the letters as words, using them, so you are able to copy code almost immediately. Secondly, and of extreme importance to anyone who wants to save a few dozen hours of practice getting over that cursed ten words per minute hump that other code courses set you up for. . .the 73 tapes start you right out with all characters being sent at 13 wpm. . .just the spacing is for 6 wpm. Thus you don't have to learn the code characters at 5 wpm, then again at 6, at 7, at 8 and so on as you do with all of the graduated speed code tapes. You learn each character just once and you've got it.

And what kind of code course takes you to 18 wpm when the Extra requires 20 wpm? The 73 cassettes run you at 21 wpm, giving you a good margin for error and panic. And they give you cypher instead of plain language, an added margin for error. . .so you can't memorize the tapes.

Which do you want. . .1930's code or 1970's? Remember that the 73 code courses are advertised ONLY in 73.

QST EDITORIAL

The November QST had an editorial that really got quite a few manufacturers uptight. The gist of it was that QST refuses to carry advertising for firms which put out shoddy merchandise and so, if you don't see an ad in QST, you'd better watch out. Some manufacturers got mad about this because quite a few of them have tried QST and been disappointed in the advertising results and now run their ads elsewhere — yet they feel that QST is putting on the screws and forcing them to run ads in QST, even

Continued on page 136.

Not just another 2 meter FM transceiver

A total coverage, synthesized transceiver for the FM enthusiast

SIGMASIZER
200R

- 200 channel coverage of 146-148 MHz.
- Simplex or repeater operation.
- 10 watt or 1 watt power output.
- Automatic high or low 600 KHz repeater offset (146-147 low; 147-148 high).
- Priority channel for instant selection of your favorite frequency.
- "Performance plus" receiver utilizing front-end selective resonators for optimum intermodulation rejection and both HI and LO IF filters for maximum selectivity.
- Built-in tone burst.
- Plus many more exciting features.

Specifications subject to change without notice.

YAESU
MUSEN USA INC.

Visit your dealer for details or write for our new catalog.

All Yaesu products warranted by the selling dealer. Complete after-warranty service available in Paramount, Calif.

7625 E. Rosecrans Avenue, Unit #29 Paramount, California 90723 (213) 633-4007

Vhf engineering

— DIV. of BROWNIAN ELECTRONICS CORP. —

320 WATER ST. P.O. BOX 1921 BINGHAMTON, NY 13902 607-723-9574

MINI-CATALOG 1975

THE WORLD'S MOST COMPLETE LINE OF VHF—FM KITS AND EQUIPMENT

CD1 Kit	10 channel receive xtal deck w/diode switching		**$ 6.95**
CD2 Kit	10 channel xmit xtal deck w/switch and trimmers		**$14.95**
COR2 Kit	complete COR with 3 second and 3 minute timers		**$19.95**
SC2 Kit	10 channel auto-scan adapter for RX		**$19.95**
TX144 Kit	exciter—1 watt—2 meters		**$29.95**
TX220 Kit	exciter—1 watt—220 MHz		**$29.95**
TX432 Kit	exciter—**NEW**—432 MHz		**coming soon**
RX144/220 F Kit	140-170 or 210-240 MHz rcvr w/8 pole cer 455 filter		**$65.95**
RX144/220 C Kit	140-170 or 210-240 MHz rcvr w/2 pole 10.7 xtal filter		**$69.95**
RX432 C Kit	**NEW**—432 MHz receiver		**coming soon**
HT144 B Kit	2 meter—2w—4 channel—hand held xcvr		**$129.95**
PA1501H Kit	2 meter pwr amp—15w—compl. kit w/SS switching		**$49.95**
PA2501H Kit	similar to above—24w		**$59.95**
PA144/15 Kit	similar to PA1501H less case, connectors and switching		**$39.95**
PA144/25 Kit	similar to above—25w		**$49.95**
PA220/15 Kit	similar to PA144/15 for 220 MHz		**$39.95**
PA432/10	**NEW**—similar to PA144/15 except 10w and 432 MHz		**coming soon**
PA4010H Kit	10w in—40w out—relay switching		**$59.95**
PA110/10	10w in—110w out 2 meter amp	factory wired	**$179.95**
PA110/30	30w in—110w out 2 meter amp	factory wired	**$149.95**
PS3 Kit	power supply regulator card		**$ 8.95**
PS12C Kit	12 amp—12 volt regulated power supply w/case		**$69.95**
PS24C Kit	24 amp—12 volt regulated power supply w/case		**$99.95**
RPT144	**NEW**—15 watt—2 meter repeater	factory wired	**$595.95**
RPT220	**NEW**—15 watt—220 MHz repeater	factory wired	**$595.95**
RPT432	**NEW**—10 watt—432 MHz repeater		**coming soon**

Repeaters are available in kit form—write for prices

ORDER FORM

ITEM	PART #	DESCRIPTION	PRICE	EXTENSION

NAME _____ TOTAL _____

ADDRESS _____ SHIPPING _____

CITY _____ NYS RESIDENTS-SALES TAX _____

STATE _____ ZIP _____ TOTAL ENCLOSED _____